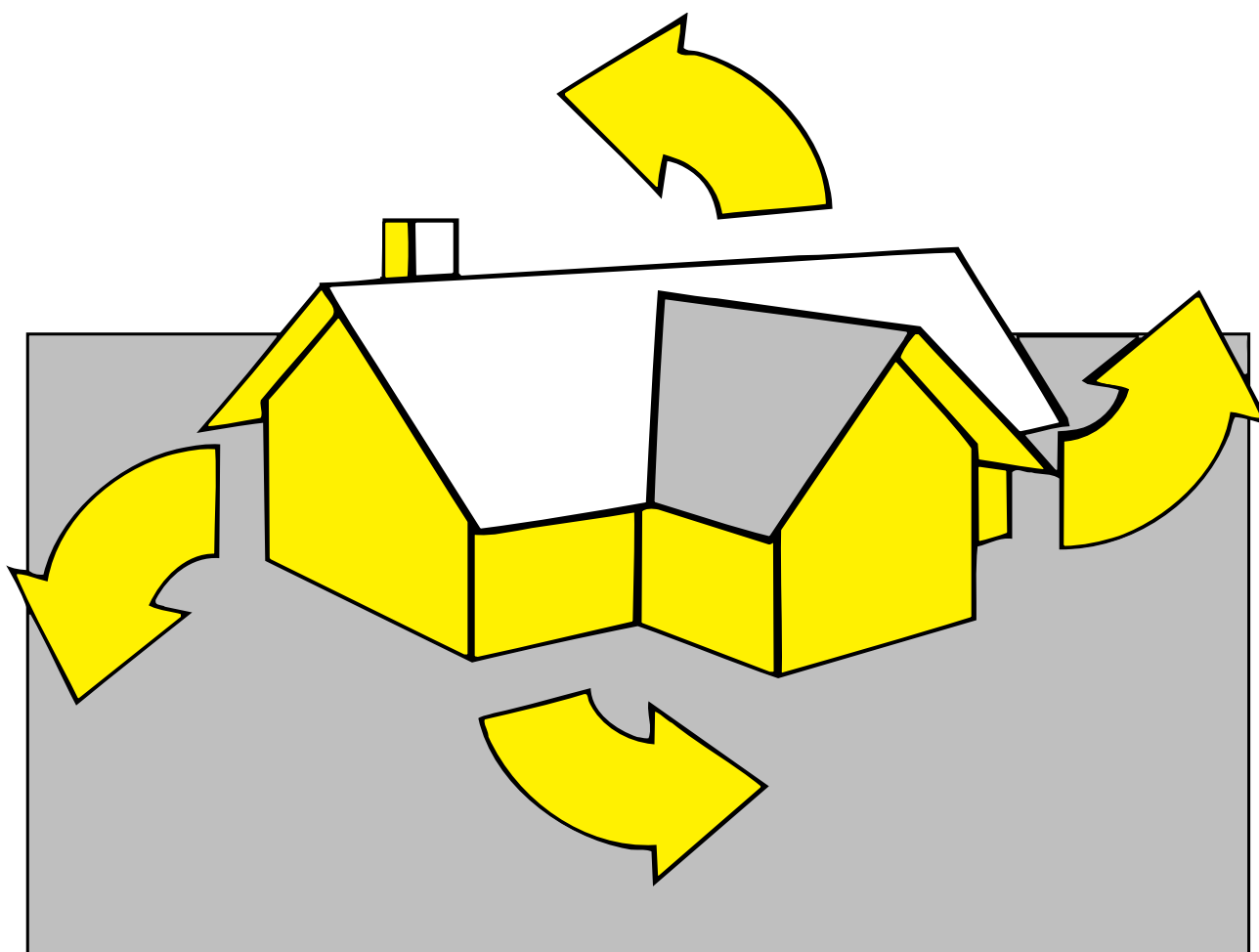

Lessons in Solid Waste Management

For Teachers Grades 4–8
A School Enrichment Program



Household Hazardous Waste

Kansas State University
Agricultural Experiment Station and
Cooperative Extension Service

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What is a Household Hazardous Product?

A household hazardous product is one whose use, storage, or disposal poses a threat to human health or the environment. Products are considered hazardous if they have one or more of the following properties:

- **Flammable:** Can be easily set on fire or ignited. Examples include gasoline, paint strippers and nail polish removers.
- **Reactive:** Can detonate or explode through exposure to heat, sudden shock, pressure or incompatible substances. Examples include certain swimming pool chemicals and some drain cleaners.
- **Corrosive:** Can burn and destroy living tissues when brought in contact. Examples include oven cleaners, auto batteries and some spot removers.
- **Toxic:** Capable of causing injury or death through ingestion, inhalation, or absorption. Examples include pesticides, furniture polishes and antifreeze.

Thousands of consumer products are hazardous; but for ease of remembering, they can be broken into the following general categories:

Category	Examples of Household Hazardous Products
Automotive products	gasoline, motor oil, antifreeze, windshield wiper fluid, car wax and cleaners, lead-acid batteries, brake fluid, transmission fluid
Home improvement	paint, varnish, stain, paint thinner, paint stripper, caulk, products adhesives
Pesticides	insecticides and insect repellant, weed killers, rat and mouse poison, pet sprays and dips, flea collars, mothballs, disinfectants, wood preservatives
Household cleaners	furniture polish and wax, drain openers, oven cleaners, tub and tile cleaners, toilet bowl cleaners, spot removers, bleach, ammonia
Miscellaneous	household batteries, cosmetics, pool chemicals, shoe polish, lighter fluid, prescription medicines, arts and crafts materials

Product Labeling

You can tell whether a product is hazardous by reading the label. There are two specific sets of federal regulations for labeling hazardous products: hazardous products other than pesticides, which can be toxic, corrosive, flammable, or reactive, are regulated by the Consumer Product Safety Commission; and products containing pesticides, which are designed to be toxic, are regulated by the Environmental Protection Agency.

When reading the product label, look for the signal word and principal hazard information. The labels on both non-pesticide hazardous products and pesticides must contain the appropriate signal word depending on the hazard associated with each product. See Table 1 for information on signal words and other label requirements.

Table 1**Nonpesticide Product Label Requirements****Signal Words:**

danger—means the product is extremely flammable, extremely corrosive, or highly toxic

poison—means the product is highly toxic

warning or caution—means the product is less toxic

Must contain statement “Keep out of reach of children” or its practical equivalent.

Must contain description of the principal hazards involved in using the product. Words used to describe these hazards include *Flammable*, *Corrosive*, *Vapor Harmful*, *Harmful if Absorbed Through Skin*.

Pesticide Product Label Requirements**Signal Words:**

danger or poison—means the product is highly toxic

warning— means the product is moderately toxic

caution—means the product is slightly toxic

Must contain statement “Keep out of reach of children” on the front label.

Must contain information on any fire, explosion, or chemical hazards the pesticide poses.

Must contain information on how to avoid the hazards the product poses.

Unfortunately for the consumer, labels often serve more as a product advertisement than as a source of information for product safety. The brand name and effectiveness of the product are often the most visible words on the label. It is necessary to read the small print and all wording on the label to find clues and information which can guide you in determining product safety.

Hazardous Products and the Human Body

The image many people have of the health threat from hazardous products involves a child becoming sick from swallowing a cleaning product stored under the sink. However, we can all be exposed to hazardous products through a variety of activities. Many of us do not recognize our bodies' responses to hazardous product exposure.

How Do Hazardous Substances Enter Our Bodies?

Hazardous substances may enter our bodies through one or more of these routes:

- Ingestion—eating or drinking hazardous substances or contaminated food and water.
- Inhalation—breathing in hazardous gases, vapors, fumes, dusts and sprays.
- Skin absorption—hazardous products containing corrosives or irritants can injure the skin and may be slowly absorbed into the body tissues and bloodstream. Some hazardous substances (such as organic solvents) can be absorbed through skin contact without damaging the skin and without your being aware of it. Many hazardous products may cause eye damage if splashed into the eye. Eyes are particularly vulnerable to injury from hazardous substances.

Types Of Health Effects

Acute health effects are signs and symptoms that result from a single exposure, such as headaches, dizziness, skin or eye irritation, vomiting, coma, or death. Symptoms usually occur shortly after exposure and may range from minor to severe.

Chronic health effects are gradual and occur through repeated exposure over an extended period of time, such as cancer, liver or kidney damage, birth defects, or central nervous system damage.

There is generally more information available on the acute effects of hazardous ingredients than chronic effects because it is much easier to quantify short-term effects. Isolating the long-term effects of a single ingredient is difficult because individuals are exposed to hazardous substances from a variety of sources; there may be a lapse in time between exposure and the development of symptoms; and symptoms may vary from one individual to another.

How Do Our Bodies Respond to Hazardous Substances?

Skin and Eyes: The physical effects of skin contact include skin reddening, blistering, itching and thickening. If hazardous substances enter the eye, they may cause tearing, irritation of the cornea, inflammation and blindness.

Respiratory System: The respiratory system has a variety of responses, such as coughing, to inhaled hazardous substances. But these responses are not effective against solvent vapors, irritating gases, and other nondust hazardous substances. These substances may damage the lungs. Gases or solvent vapors can dissolve into lung tissue and damage it and/or enter the circulatory system.

Digestive System: If corrosive substances are ingested, they may damage the mouth, esophagus and stomach. Other hazardous substances may be transported across the intestine into capillaries and then throughout the circulatory system. The blood from the stomach and intestines reaches the liver before reaching other body organs and so the liver may be damaged.

Liver and Urinary System: The liver and the kidneys are organs of detoxification and excretion of metabolic wastes. Organ damage can result when the capacity to detoxify is exceeded.

Circulatory System: This system can transport hazardous substances that the body has been exposed to. However, the blood, blood vessels and heart may be damaged.

Nervous System: Most organic solvents cause depression of the central nervous system. Symptoms from over-exposure include feeling high, fatigue, dizziness, lack of coordination, confusion, sleepiness and nausea. Very high levels may result in coma or death.

Reproductive System: Some hazardous substances can effect reproduction resulting in reduced fertility in both men and women, genetic damage, and lowered sexual function. Hazardous substances that cause genetic damage are called mutagens. Hazardous substances that can pass through the placenta and effect the developing fetus are called teratogens. These include many metals (lead, mercury, copper and cadmium) and organic solvents.

What is the Risk From Exposure?

People vary in their susceptibility and response to exposures to hazardous substances. There are those individuals who begin smoking cigarettes at age 10 and live to a ripe, old age, while others who smoke develop lung cancer at a very young age. The effects of exposure to a hazardous substance depend upon individual characteristics, such as heredity, overall health, height, weight, gender, amount of exposure and age.

Children are of Special Concern

Children are of special concern since they have specific traits that make them more prone to harm from exposure to hazardous products than adults. These traits include:

- Higher metabolism, so they absorb more toxic substances;
- Faster breathing rates, so they inhale more toxins relative to body size;
- Lower body weights, so they have more toxins per pound of body; and
- Developing immune systems, organ systems, and brain and nervous systems, which are more prone to damage.

Children also have frequent contact with their environment by playing in the dirt, in the water, and on floors and carpets. As a result, they have more opportunities to be exposed to toxins in the environment. In addition, children often have cuts and abrasions which makes skin absorption more likely.

Hazardous Products and the Environment

How hazardous substances move through the environment and where they end up is determined by such factors as the physical state of the material and the method of transport. For instance, volatile materials may contaminate the air, while water soluble materials may be transported by water. Another factor is whether or not the substance is a persistent material. Persistent materials take a long time to break down, if ever.

Persistent materials can concentrate through the food chain in a process called bioaccumulation. A number of smaller organisms that are contaminated are eaten by larger ones. The larger ones are eaten by a larger one, etc. The further along the food chain, the greater the concentration. Humans are one of the top predators of these systems and so can accumulate a large amount of toxins. A chemical that shows no effect in a small concentration could be very injurious or fatal when concentrated in the predator. In some states, chlordane used for termite control has washed from homes and yards into the rivers and required a fish consumption warning in some rivers.

Routes Into the Environment

Household hazardous wastes enter the environment through a number of routes. Here is what can happen for different methods of household hazardous waste disposal.

IN THE TRASH

In many areas garbage is picked up at the curb and taken to a transfer station, where it is compacted. From there it is hauled to the landfill. The trash is dumped into the section of the landfill currently being used and further compacted by heavy equipment. This can result in containers breaking open and spilling their contents. Liquids put in the landfill combine with rainwater and soak through the garbage. Soluble hazardous materials may be washed with them, producing leachate. Leachate will flow downhill over surface land, or will percolate through the soil until it reaches an impermeable layer. Leachate can contaminate groundwater and surface water. According to federal regulations, new municipal landfills must have a protective lining, leachate collection system and groundwater monitoring system. But many landfills designed before the standards were established are contaminating the environment.

DOWN THE DRAIN

Twenty percent of household hazardous wastes goes down the drain or gets flushed down the toilet. From there it goes either into the municipal wastewater treatment system or into a septic system.

- Into the Wastewater Treatment System

The wastewater system is a network of underground pipes that collects liquid waste from each building in town and brings it together in huge pipes called trunk lines. Not long ago, sewage used to be dumped directly into rivers, lakes and oceans. Now, most cities and towns have a municipal wastewater treatment plant that cleans up sewage before it is pumped into rivers, lakes and oceans.

At the treatment plant, sewage is treated with chlorine to kill any disease-causing organisms. Much of the solid material and some of the pesticides, polychlorinated biphenyls (PCBs), and heavy metals are removed by allowing them to settle out in a residue called sludge. Common heavy metals in sewage are lead, zinc, mercury, and cadmium. Sources of these heavy metals include household batteries, cleaners and paints. Exposure to heavy metals, in greater than small concentrations, can be harmful to human health and the environment. Sludge is often applied to farm land as fertilizer. Persistent chemicals and heavy metals in the sludge can then begin to move through the environment.

In addition, hazardous substances poured down the drain or flushed down the toilet can damage pipes and trunklines, or the treatment plant. Workers can suffer injuries as well when flammable materials or hazardous vapors reach the treatment plant.

- Into the Septic System

Many homes in the United States are connected to a septic system, instead of a wastewater treatment plant, especially in rural areas and small communities. In a septic system, bacteria break down much of the waste. However, if hazardous wastes are dumped into the septic system, they can kill the helpful bacteria and contaminate the septic tank sludge or the drain field soil. The sludge, pumped every few years from the tank, is disposed of either at a wastewater treatment plant, a lagoon, or a sludge landfill. If a tank is not pumped out periodically, the bacteria will die, allowing harmful substances into the groundwater or causing the drainfield to become blocked, backing up the system.

INTO THE STORM DRAIN

Storm drains are commonly misused for the disposal of paint, motor oil, antifreeze, pesticides, and other wastes. Unfortunately, storm drains do not purify and remove pollutants. In many communities, storm-water runoff is discharged directly into nearby streams, rivers, lakes, or even sinkholes, which are conduits to groundwater. In other communities, storm drains empty into the wastewater treatment plant where pollutants adversely affect the quality of the treated water and the sludge.

BURNING TRASH

If you burn household hazardous waste, what happens? This depends on the type of material in the waste being burned. A pressurized aerosol can could explode, burning paint or batteries could leave a residue of heavy metals, burning solvents might vaporize the liquid into the air, and burning plastics can release poisonous fumes or release toxic compounds into the atmosphere which last a long time. In addition, burning trash does not completely consume the wastes because of the low temperatures from these fires. Particles are released which can carry hazardous substances. These particles may be breathed in by humans, animals, and plants, and can contaminate soil and water.

DUMPING WASTES ON THE GROUND

If household hazardous waste is dumped on the ground or in a ditch, where does it go? Rain-water can carry the wastes over land, along ditches, to a waterway or into the groundwater. Water drains or soaks into the ground until it hits an impermeable layer, such as clay. The water then collects in the spaces between sand, gravel, or rock particles. Underground areas where groundwater collects are called aquifers. Some aquifers replenish lakes or streams. Wells that serve a large percentage of people in this country with drinking water are drilled into aquifers. Thus, as a result of hazardous waste runoff and improper disposal, drinking water supplies can become contaminated.

How is Household Hazardous Waste Managed?

Many people understand that household hazardous waste should not be thrown away. The best disposal option for unwanted, but usable household hazardous products is to use them up or find someone who can. If the products are no longer usable, but can be recycled, they should be taken to a recycling outlet. If these options are not possible, the products should be saved for a household hazardous waste collection program. There have been over 4,500 collection programs in the United States since the first one was held in 1980. When a community holds a household hazardous waste collection, people are encouraged to bring unwanted and unusable household chemicals to a designated location. There, trained workers remove the products from the vehicles, sort them into types of waste, pack them in drums, and then dispose of the wastes, usually to a special hazardous waste incinerator or landfill. The average amount of waste brought into a collection program is 100 pounds per household.

Types of Collections

There are several types of household hazardous waste collections. The type of collection a community chooses often depends upon the availability of funds and whether its citizens live in a rural or urban setting.

ONE-DAY COLLECTIONS

One-day collections allow householders to bring their household hazardous waste to a designated location on a specified date. Wastes that are brought in are recycled if possible, and the rest are immediately packaged and sent to a hazardous waste treatment or disposal facility.

PERMANENT COLLECTIONS

Permanent collection facilities are designed to store household hazardous wastes for short periods of time. At a permanent collection facility, householders bring their hazardous waste by appointment or during open hours.

DOOR-TO-DOOR COLLECTIONS

Some communities provide door-to-door collections where trained staff pick up materials in a retrofitted truck and sort, package, and store at a main facility until enough waste is collected to warrant disposing of it. Door-to-door is particularly helpful to elderly and/or disabled people. In most areas this collection is done by appointment. This is a very expensive service and typically is provided in conjunction with other collection events.

CURBSIDE COLLECTIONS

Some communities provide a curbside collection program where yellow boxes are set out at the curb for pickup of household hazardous wastes. Typically, only certain wastes are accepted, such as waste oil, household batteries, or auto batteries.

MOBILE COLLECTIONS

Mobile sites stay in one location for a specific period and then move the whole operation to the next site in within the service area. Collection sites can be at malls, fire stations, church lots, store parking lots, etc. At the end of the collection period at the site, the waste is placed on a truck and transported back to the main facility; or if the truck is not full, it moves on to the next site.

What Happens to Materials Collected at a Household Hazardous Waste Collection?

The ultimate destination of household hazardous wastes depends upon the individual characteristics of each waste. For example, used motor oil and antifreeze can be recycled; some acids and bases can be neutralized; and some flammable or combustible liquids can be fuel blended and burned. Other wastes must be packaged and sent to a hazardous waste facility.

Household hazardous waste collections are good because they rid homes of stores of old products and help to educate and safeguard the community. But they are also very expensive and the hazardous waste landfills or incinerators do not operate without their own environmental costs. Thus, it is vital that we take steps to reduce the amount of household hazardous waste we generate.

Reducing Risks and Minimizing Wastes

There are a variety of actions each of us can take to reduce risks from household hazardous products and to minimize household hazardous wastes.

Before You Buy a Product

- Read labels carefully. Avoid buying products with labels containing the words: caustic, corrosive, danger, explosive, flammable, poison, toxic, volatile, or warning.
- Use safer products whenever possible. Safer alternative products can be found in stores. Recipes for cleaning products using common kitchen ingredients, such as baking soda and vinegar, can be found in books available through most libraries. (See Resources.)
- Buy the least hazardous product. Let the signal words serve as a guide.
- Buy household hazardous products only in the amount you need for the task at hand.
- Buy hazardous products in childproof packaging.
- Check to see if safety equipment is required when using this product. Make sure you have the proper equipment on hand or that you purchase it for use with the product.
- Avoid aerosol products. Aerosol cans disperse the product in tiny droplets that can be deeply inhaled into the lungs and quickly absorbed into the bloodstream. In addition, aerosols ignite easily and may explode when subjected to high temperature or pressure.

Use it Safely

- Read all labels before using hazardous products, paying careful attention to proper use instructions and dangers.
- Do not mix products unless instructed by label directions. Mixing products can cause explosive or poisonous chemical reactions. Even different brands of the same product may contain incompatible ingredients which may react when mixed together.
- During use, keep hazardous products out of the reach of small children. If the phone rings or you are called out of the room, close the product and take it with you or take the child with you. Do not leave products unattended or unsealed.

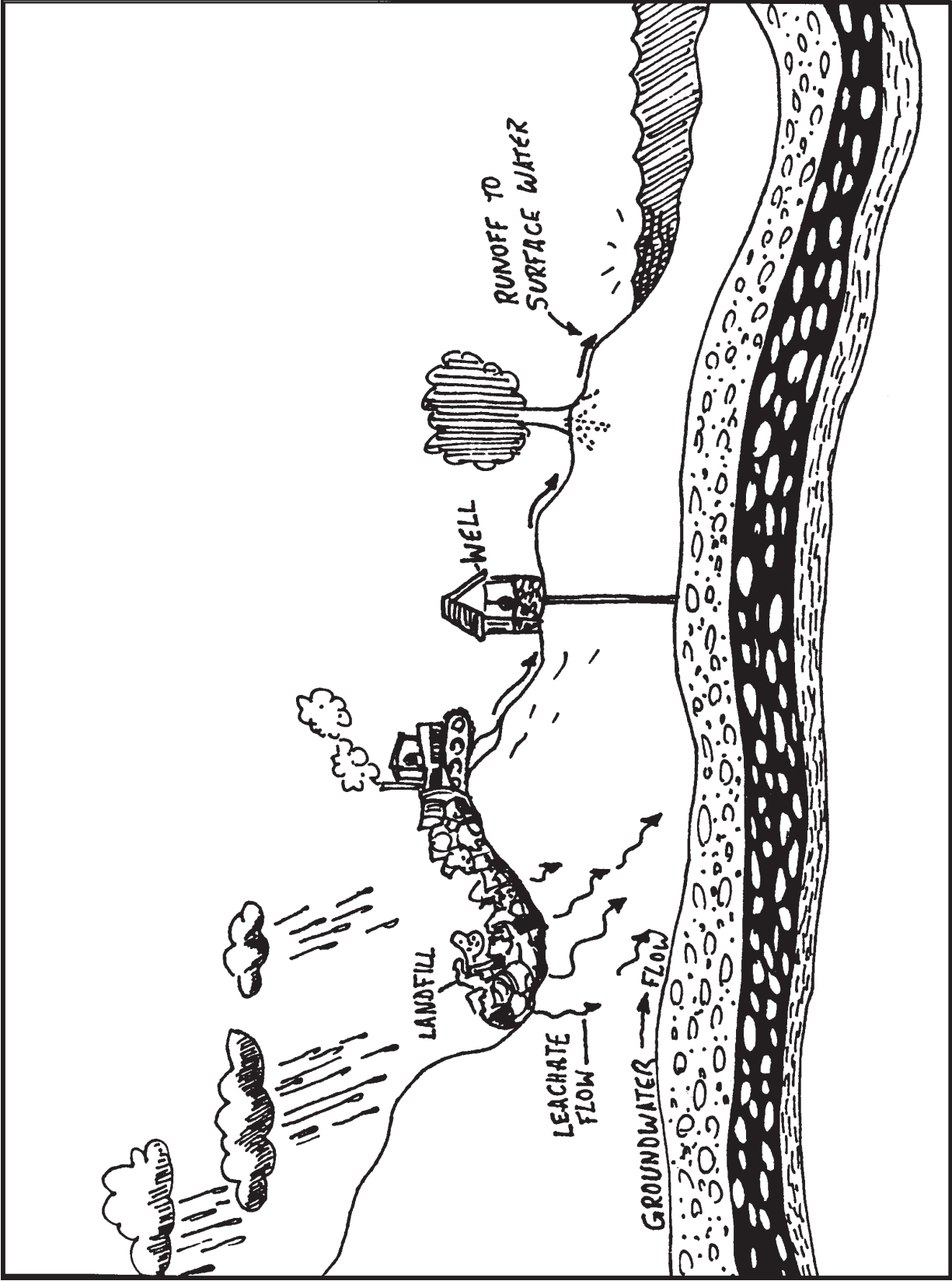
- Avoid wearing soft contact lenses when working with solvents and pesticides. They can absorb vapors from the air and hold the chemical against your eyes.
- Do not eat, drink, or smoke while using hazardous products. Traces of hazardous substances can be carried from hand to mouth. Smoking can start a fire if the product is flammable.
- Use products in well-ventilated areas to avoid inhaling vapors. Try to keep lids closed as much as possible while working with hazardous products to minimize the vapors. Work outdoors whenever possible. When working indoors, open windows and use an exhaust fan. Position the fan to draw air away from the work area to the outdoors, rather than recirculating it indoors. Take plenty of fresh air breaks. If you feel dizzy or nauseous, tightly seal the product, go outside, and take a break.
- Use protective gloves, goggles, and respirators that are appropriate to the task if the product presents hazards to skin, eyes, or lungs.
- Clean up after using hazardous products. Carefully seal products and properly refasten all caps.

Store it Safely

- Keep products out of the reach of children and animals. Store all hazardous products in locked cabinets, in cabinets with childproof latches, or in other secure structures.
- Make sure lids and caps are tightly sealed and childproof.
- Make certain all products are clearly labeled before storing them.
- Leave products in their original containers with the contents clearly identified on the labels. Never put hazardous products in food or beverage containers.
- Keep products away from sources of heat, spark, flame, or ignition. These sources include pilot lights, switches and motors. This is especially important with flammable products and aerosols.
- Store products containing volatile ingredients, or those that warn of vapors or fumes, in a well-ventilated area.
- Store gasoline in safety-approved containers only in a well-ventilated area away from all sources of heat, spark, flame or ignition.
- Know where flammable materials are located in your home and how to extinguish them. Keep a working ABC-rated, or Multi-Purpose Dry Chemical, fire extinguisher in your home.
- Keep containers dry to prevent corrosion. If a product container is beginning to corrode, place the entire container in a plastic bucket with a tight-fitting lid and pack non-flammable absorbent, such as cat box filler, around the container. Clearly label the bucket with its contents and appropriate warnings.

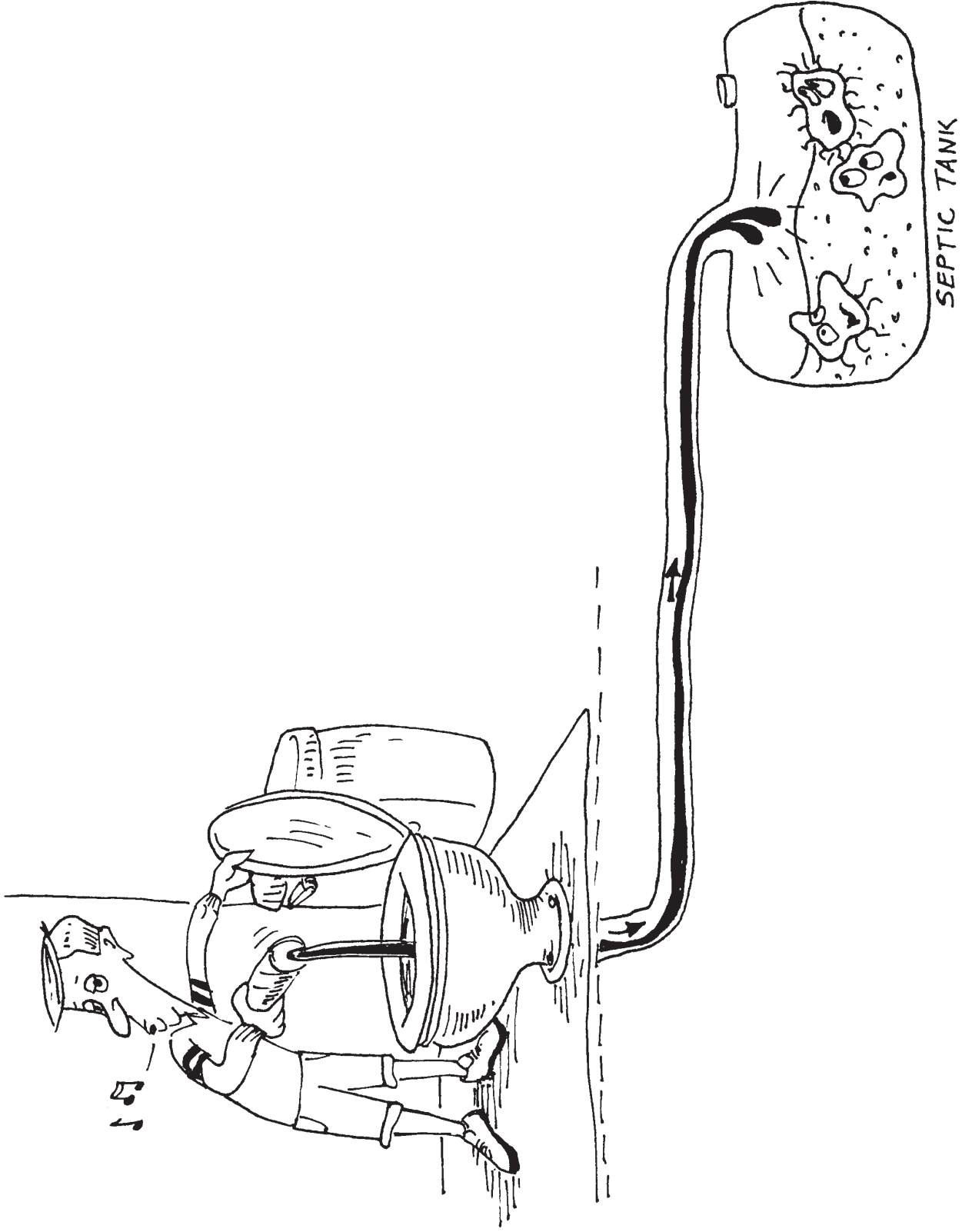
Dispose of it Safely

In most cases, the best thing to do with a leftover product is to use it all according to the label directions or find someone that will use it. Banned or restricted pesticides, old medicines, and products whose safety instructions are no longer readable should not be used or shared. Some household hazardous wastes, including lead-acid batteries, button batteries, used motor oil, and antifreeze can be recycled. For many household hazardous products there may be no safe disposal available. These products must be stored safely until your community holds a household hazardous waste collection.



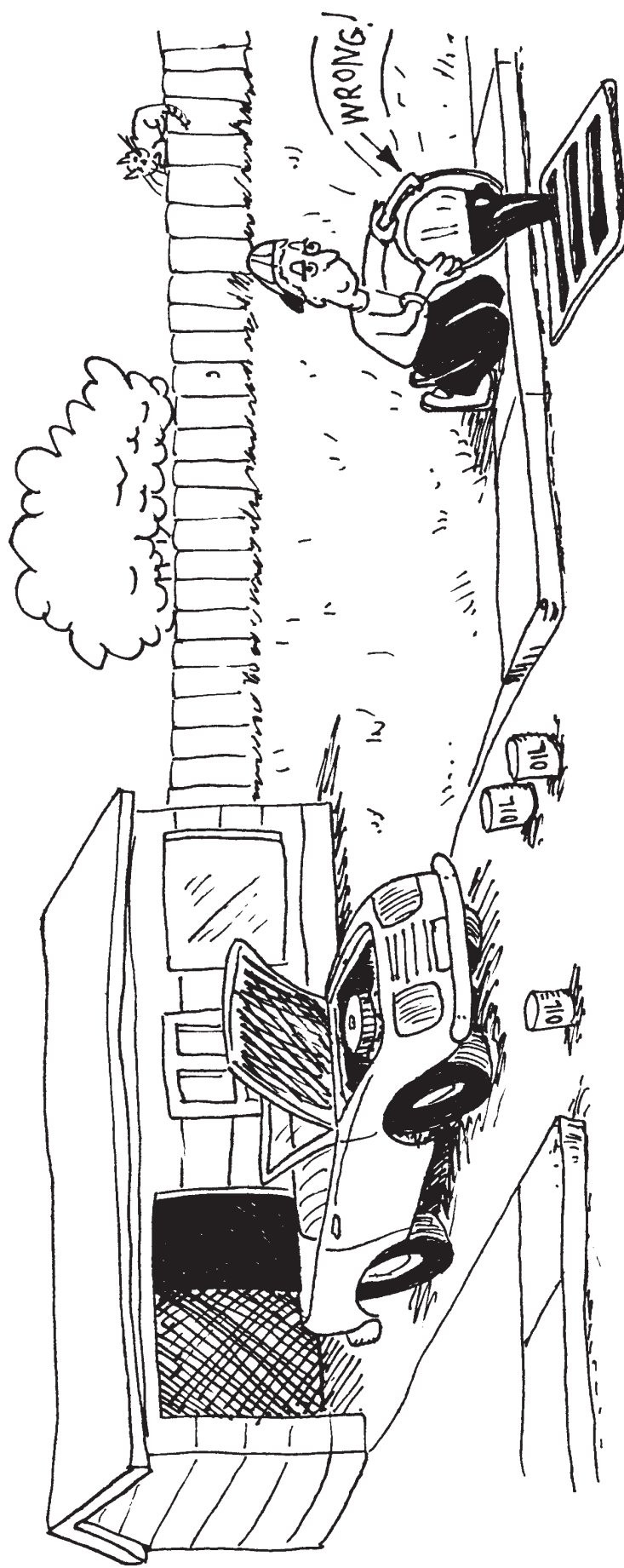
In the Trash

From A-Way With Waste



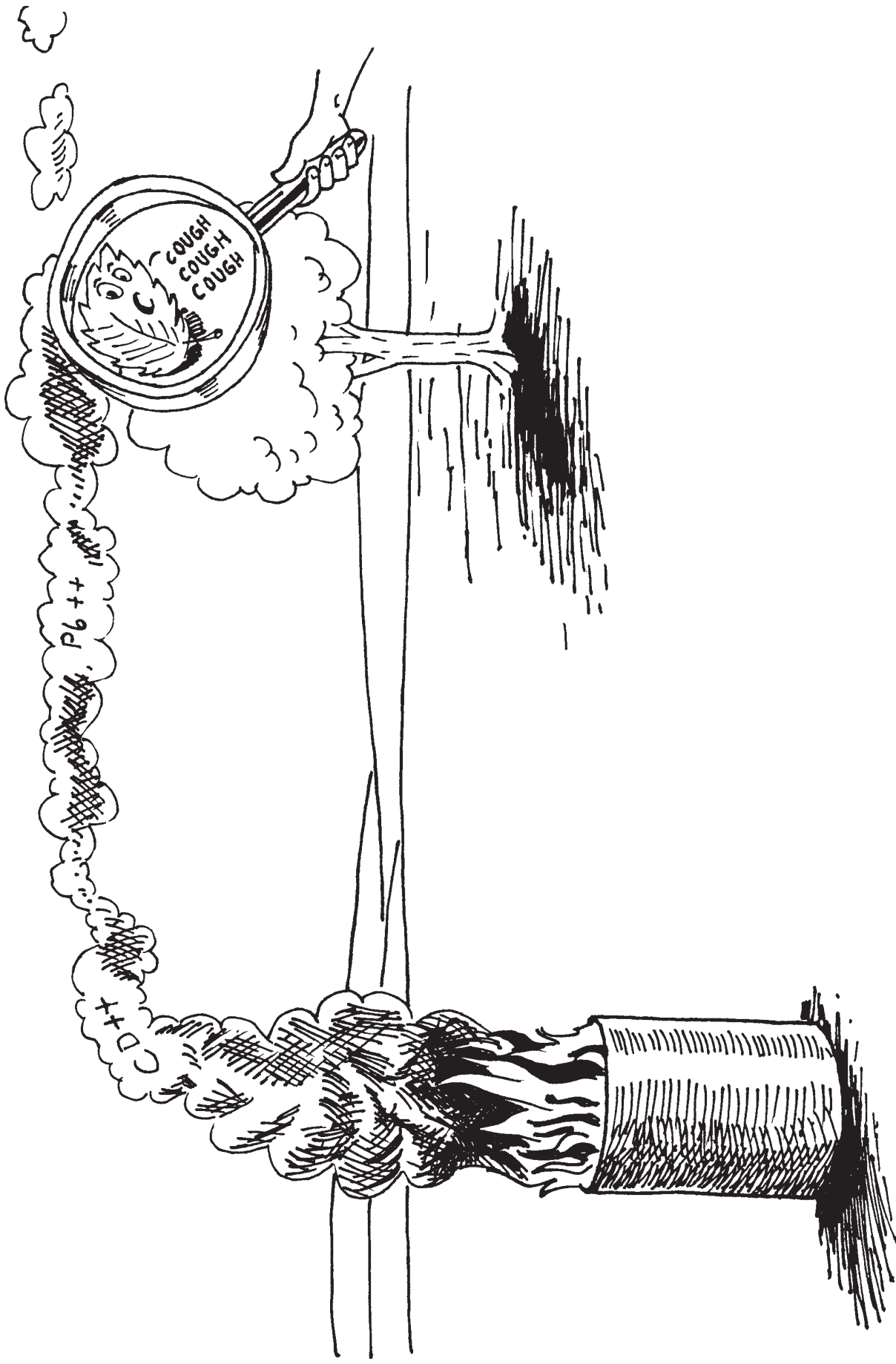
Into the Septic System

From A-Way With Waste



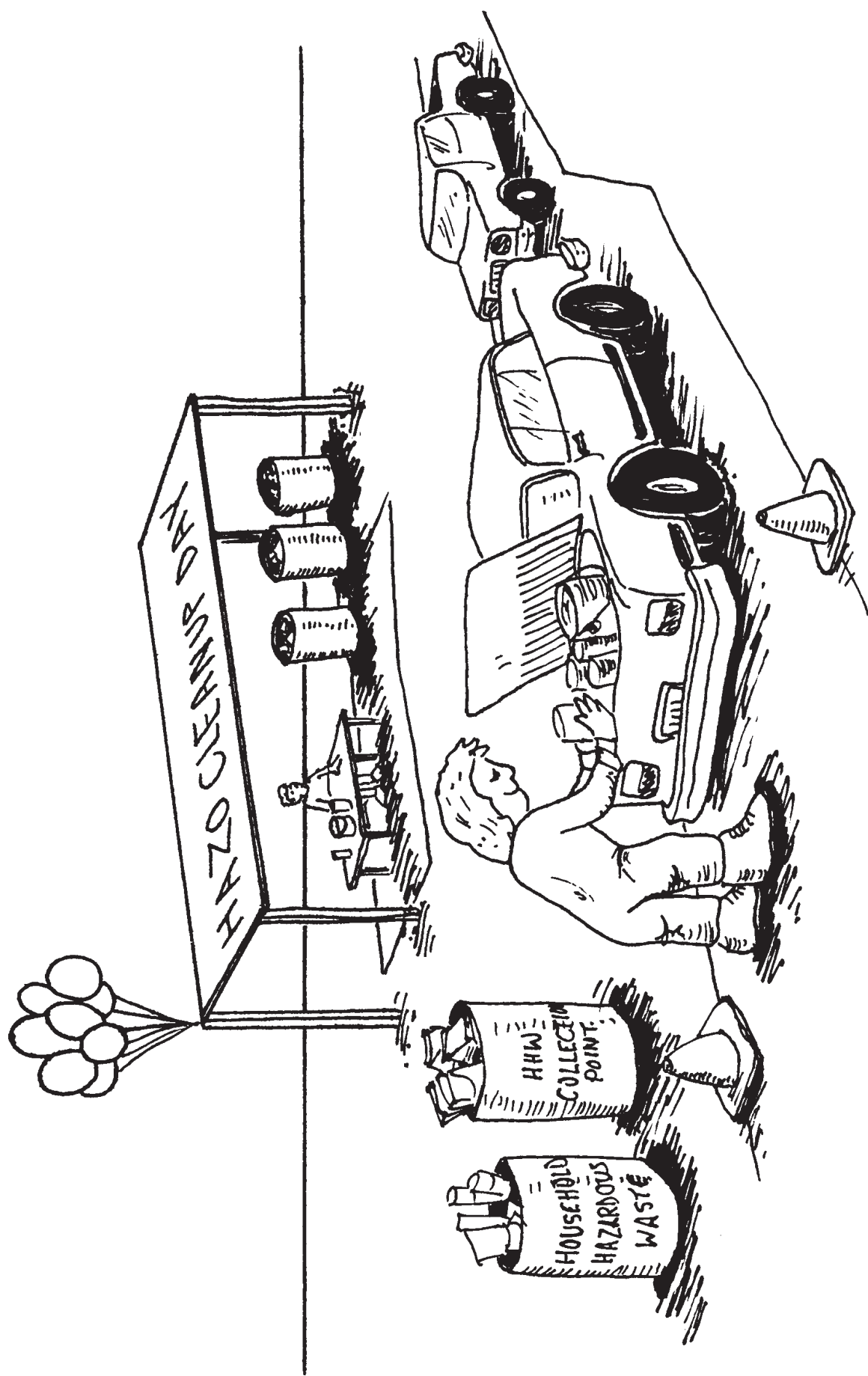
Into the Storm Drain

From A-Way With Waste



Burning Trash

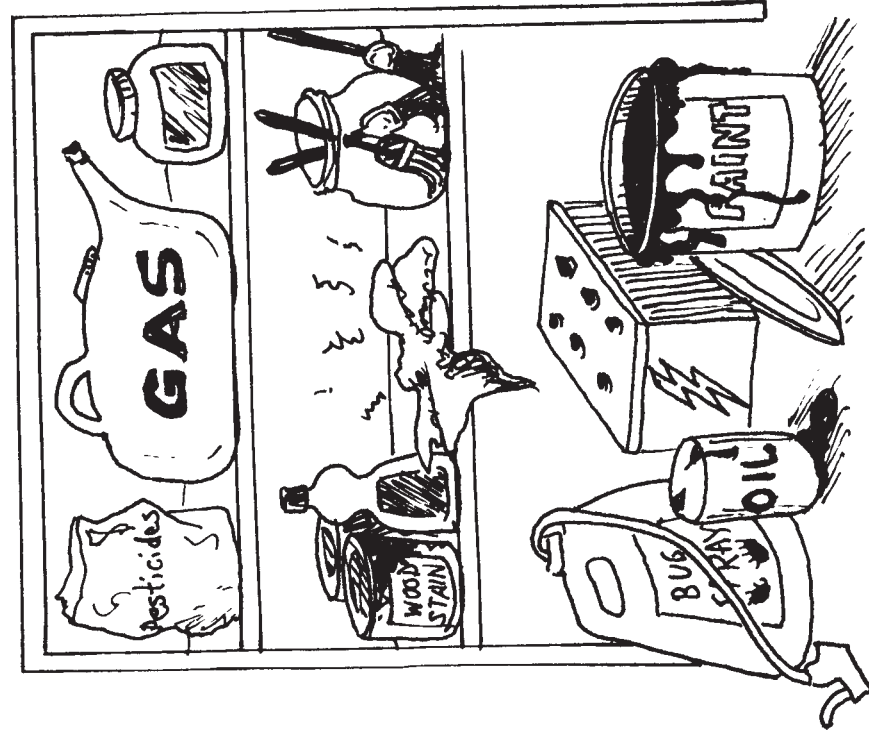
From A-Way With Waste



One-Day Collections

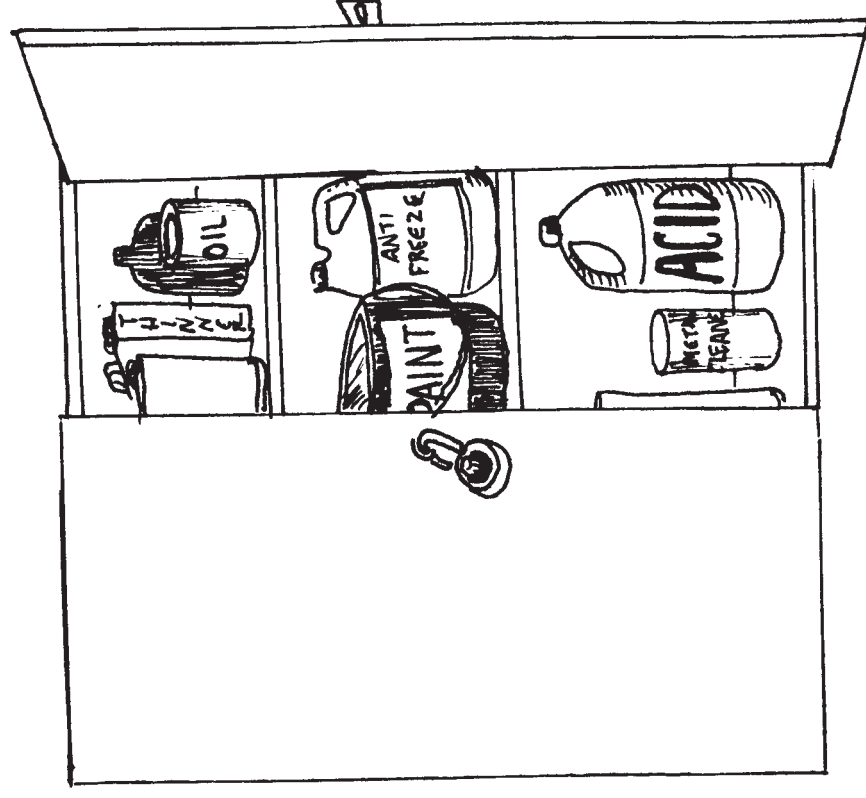
From A-Way With Waste

Store hazardous products in their original containers with lids and caps tightly sealed. Keep them in a locked cabinet, out of the reach of children and animals.



Unsafe

Store it Safely



Safe

From Household Hazardous Waste Project

Read the Label

Rationale

Some of the most common and frequently used household products contain hazardous ingredients. Understanding how to use, store, and dispose of such products wisely begins with knowing which products are hazardous.

Learning Outcome

Students identify what types of products are hazardous and the characteristics that make them hazardous. Students determine how to detect hazardous products by examining product labels and recognizing signal words.

Teacher Background

See Teacher Introductory, pages 3 to 4. A household product is considered hazardous if it has one or more of the following: corrosive, flammable, reactive, or toxic. Thousands of consumer products are hazardous, but for ease of remembering they can be broken into the following general categories: automotive products, home improvement products, pesticides, household cleaners, and miscellaneous. Labels of hazardous products are required by federal law to list signal words which indicate the degree of hazard associated with the product.

Materials

- Picture of a pesticide product
- Copies of *Sample Hazardous Product Labels*
- Copies of *Label Reading Worksheet*
- Overhead projector
- Overhead of “Hazardous Characteristics”

Learning Procedure

1. Ask: What does hazardous mean? Hold up a picture of a pesticide. Ask: Is this hazardous? What is the safest way to find out? (by reading the label). What other household products might be hazardous? Write the students’ responses on the board.
2. Discuss the five categories of household hazardous products: automotive, home improvement, household cleaners, pesticides and miscellaneous. Write these categories on the board and have students identify the appropriate category for each product listed on the board. Ask students to name additional products for each category.
3. Ask: What characteristics make a product hazardous? Explain that a hazardous substance has at least one of these properties: toxic, corrosive, reactive or flammable. Refer to the overhead of “Hazardous Characteristics.” Define each characteristic and provide examples. Ask students to provide additional examples of products that have these different characteristics.
4. **Ask:** What information on a product label tells us that the product may be hazardous? What key words should we look for? Explain to students that labels of hazardous products are required by federal law to list signal words. Signal words indicate the degree of hazard associated with the product. DANGER or POISON indicate that the product is highly toxic, corrosive, or extremely flammable. WARNING indicates that the product is moderately toxic. CAUTION indicates that the product is slightly toxic.

Explain that hazardous product labels may also contain words or phrases that describe the hazard(s) involved in using the product. Examples include: flammable, corrosive, harmful if swallowed, vapor harmful, eye irritant.

Inform students that the amount of safety information provided on a label can vary significantly from product to product. Discuss how labels often serve more as a product advertisement than as a source of information for product safety. Explain how it is necessary to read the small print and all of the wording on the label to find the clues and information to guide them in determining product safety.

5. Divide the class into several small groups. Distribute a copy of a *Sample Product Label* and the *Label Reading Worksheet* to each group. Have students examine the product label and fill out the worksheet.
6. After the worksheets have been completed, have each group share their findings with the class.

Questions

- What are the five categories of household hazardous products?
- List the four properties of hazardous products.
- What are the four signal words and what does each mean?
- What other words or phrases may be on a label that indicate the product is hazardous?

Sources

Adapted from *A Way With Waste* and *Toxics In My Home? You Bet!*

Label Reading Worksheet

Directions: Carefully read the information from the label and answer the following questions as completely as possible.

1. What is the name of the product? _____
2. What is it used for? _____
3. What is the signal word on the label and what does it mean? _____

4. What hazardous properties does the product have? _____

5. List any directions that help protect people's health. _____

6. Does the label offer any first aid directions? If so, what are they? _____

7. Does the label give any suggestions for storage? If so, what are they? _____

8. Is the statement "Keep out of reach of children" on the label? _____
9. Describe, from the label, directions for disposing of the empty container. _____

Hazardous Characteristics



Toxic

Any substance that can cause injury or death if eaten, inhaled or absorbed through the skin.

Examples: lead, pesticides, mercury

Corrosive

Any substance that can burn and destroy living tissues, or which causes severe corrosion rate in steel or aluminum.

Examples: battery acid, bathroom cleaners, pool chemicals



Flammable

Any substance that can be easily set on fire.

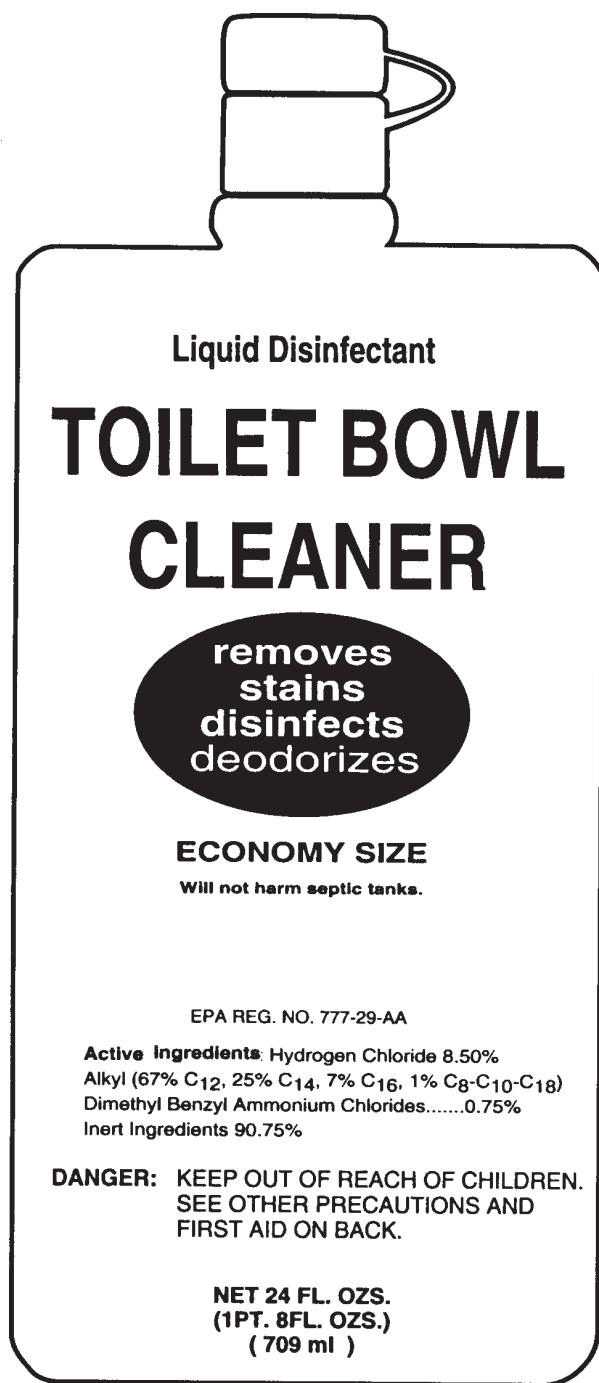
Examples: fuels, gasoline, some cleaning fluids, some furniture polishes

Reactive

Any substance which can cause an explosion when subject to heat, sudden shock, pressure or contact with an incompatible substance.

Examples: ammunitions, some swimming pool chemicals, bleach and ammonia when mixed together





Back of Label

Directions: *Point arrow away from you when opening or closing cap.* Place finger under flip top and pull to open. After opening the cap, point the top of bottle down into the bowl. **Close cap securely after each use.** Rinse brush before putting away.

Disposal Direction: Do not reuse empty container. Wrap empty container in plastic bag and discard.

Will not harm white or colored bowls. Will not harm plumbing. This product has been specifically formulated for use only in toilet bowls; it should not be used or placed on toilet lids, vanities, sinks, bathtubs, etc.; it should not be used with chlorine (bleach) or other chemical products.

Danger: Corrosive—produces chemical burns. Contains hydrochloric acid. Do not get in eyes, on skin, or on clothing. May be fatal or harmful if swallowed. Do not breathe vapor or fumes. Keep out of reach of children.

First Aid: Internal—Call a physician immediately. Drink a teaspoonful or more of magnesia, or small pieces of soap softened with water in milk or raw egg white.

External—Eyes—Wash with water for 15 minutes. Get prompt medical attention. Skin—Wipe off the acid gently; immediately flood the surface with water, using soap freely, then cover with moist magnesia, or baking soda.

From **Toxics In My Home? You Bet!**

**Back of Label**

All purpose cleaner removes: grease, heel marks, crayon, food stains, fingerprints, soap scum.

Directions: General Use: Spray onto soiled area. Wipe clean. No rinsing. Laundry Prewash: On washable fabrics, saturate soiled area, rub gently. Launder as usual. Note: Do not use on varnished surfaces. If sprayed on glass or aluminum, wipe immediately.

Caution: Contains trisodium phosphate. In case of eye contact, flush with water. Call physician. Keep out of reach of children. Non-Flammable.

Ingredients: Water, surfactants, builders, solvents and dye.

From **Toxics In My Home? You Bet!**



Back of Label

Garden spray may be used to control: aphids (plant lice), spider mites, thrips, leafhoppers, rose slugs, leaf miners, lacebugs, scale crawlers and other sucking insects on roses, gladioli, chrysanthemums and certain other ornamentals. Can also be used on grapes, apples, apricots, cherries, peaches, plums and citrus fruit to control certain specified sucking insects (see instruction sheet). Can be used on peas, tomatoes, onions and cabbage to control specified insects.

Use Garden Spray on the farm for poultry. To control chicken lice and feather mites.

Danger: Garden Spray is poisonous by swallowing, inhalation or skin contact. Do not breathe vapor or spray mist. Do not get in eyes, on skin, or on clothing. In case of contact, immediately flush skin or eyes with water and get medical attention for eyes. Launder clothing before reuse.

Antidote: Call a physician immediately. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep warm. Give strong tea or coffee. Give artificial respiration if breathing has stopped.

Notice: Buyer assumes all risks of use, storage or handling of this material not in strict accordance with directions given herewith.

Directions: Mix Garden Spray with water at the rate of 3 teaspoonfuls in 1 gallon of water to which has been added 1 ounce of soap. Spray both upper and lower sides of foliage thoroughly with this solution. Repeat applications when necessary.

To control feather mite, apply Garden Spray to tops of the perches three times, three days apart, at the rate of 1 ounce to 15 feet of roost. Repeat treatment when necessary.

From Toxics In My Home? You Bet!



Back of Label

This product is a formulation made especially for use by professionals and by those possessing at least rudimentary knowledge of removing various types of paints, varnishes and synthetic finishes. Care must be exercised in its handling. Several applications may be necessary. This product acts faster in warm weather.

Directions:

1. Unscrew cap slowly so vapors can escape.
2. Use old or inexpensive new brush.
3. Brush on thick coat in one direction only.
4. Allow to set until surface is blistered.
5. Remove finish with water, spatula, steel wool or cloth.
6. Rub clean and dry and apply new finish.
7. Close container after each use.

Extreme care should be taken to see that this material does not come in contact with any surface other than where removal of the finish is desired. Spillage on vinyl or other synthetic surfaces will cause extreme damage. Do not store this material in a plastic container. Store in cool place.

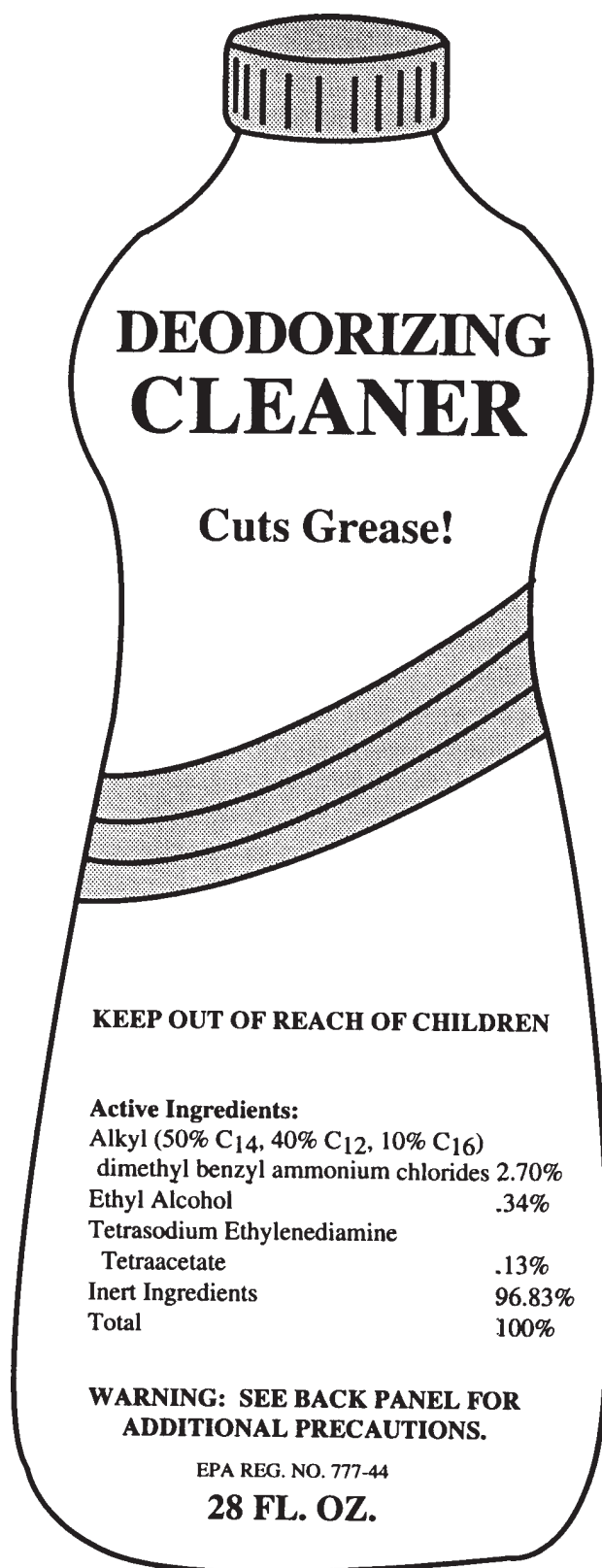
DANGER! POISON!

Contains Methylene Chloride and Methanol.
Cannot be made non-poisonous. If swallowed, induce vomiting by giving a tablespoonful of salt in warm water and repeat until vomit fluid is clear; follow with two teaspoonfuls of baking soda in glass of water. Have patient lie down and keep warm. Cover eyes to exclude light. In case of contact with eyes, flood repeatedly with water. In either case, ***call a physician.*** Avoid breathing of vapor or contact with skin or eyes. Contact with flame or hot surfaces may produce toxic gases. Close container after each use.

Use only with adequate ventilation.

Keep out of reach of children.

From Toxics In My Home? You Bet!



Back of Label

For general cleaning, disinfecting, and deodorizing of all hard, nonporous surfaces.

Directions: Use ¼ cup in half a pail of warm water (1 gallon). Wipe or mop to wet surfaces thoroughly. Rinse food preparation areas with water. For sensitive skin, use rubber gloves.

Hazardous to humans and domestic animals.
Warning: Avoid contact with eyes. Causes eye irritation. May be harmful if swallowed. Avoid contamination of food.

Statement of practical treatment: In case of accidental contact, immediately flush eyes with large amount of water for at least 15 minutes and call physician. If accidentally swallowed drink promptly a large quantity of water and call physician.

Storage/disposal: Do not reuse empty container. Wrap container and put in trash collection.

From Toxics In My Home? You Bet!



Back of Label

A blend of solvents formulated exclusively for use with most lacquer base wood and metal finishes. High strength combined with a moderate evaporation rate makes lacquer thinner an excellent cleaner and degreaser.

Use for general cleaning and degreasing of metal tools and engine parts. Clean brushes and spray equipment as long as lacquer remains soft on these tools.

Do not use on rubber, plastic, asphalt tile, linoleum or synthetic bristle brushes. Not compatible with most automotive or other specialty lacquers.

Caution: *Contains methanol and toluol cannot be made non-poisonous non-photochemically reactive.*

Keep away from heat, sparks and open flame. If swallowed, do not induce vomiting. **Call physician immediately.** Avoid contact with eyes, skin and clothing and breathing of vapor or spray mist. In case of eye contact, immediately flush thoroughly with water and get medical attention. For skin contact, wash thoroughly. Close container after each use. Do not transfer contents to unlabeled bottles or other containers.

Use only with adequate ventilation.

Keep out of reach of children.

Since the manufacturer cannot control conditions or method of application, no warranty or liability beyond the replacement of defective product is offered.

From Toxics In My Home? You Bet!

The Big Three: Routes of Exposure

Rationale

Hazardous substances can enter the body in three ways: they can be ingested, inhaled, or absorbed through the skin. Students can protect themselves from accidental exposure to hazardous substances if they understand these routes of exposure.

Learning Outcome

Students describe the ways in which hazardous substances can enter the body. Students recognize unsafe situations that lead to poisonings and identify safety precautions that should be followed to avoid harm from hazardous products.

Teacher Background

See Teacher Introductory, pages 4 to 6. We can become ill when our bodies are exposed to household hazardous products through inhalation, ingestion, or skin absorption. Acute health effects from these products are immediate and obvious, such as headaches, dizziness, skin or eye irritation, or nausea. Chronic effects, such as cancer or kidney damage, can occur through repeated exposure over a long period of time.

Materials

- Overhead projector
- Overhead of “Human Body Diagram”

Learning Procedure

1. Introduce the subject by asking students to name three ways that hazardous substances might enter their bodies and cause injury or illness. Solicit answers until the following three responses are given:
 - a. eating/drinking (ingestion)
 - b. breathing (inhalation)
 - c. skin contact (absorption)

Write these responses on the board.

2. Discuss the specific routes that substances follow after entering the body through ingestion, inhalation and skin contact. Refer to the overhead of “Human Body Diagram.”

Explain that when we eat or drink things, they travel down the esophagus which leads to our stomachs. The stomach breaks things into small pieces. From the stomach, these things travel into the small intestine. The small intestine is a very long, neatly coiled organ which has millions of tiny finger-like projections, called villi. The villi has millions of blood vessels which absorb things from the small intestine. Once things are absorbed by the blood vessels, they enter the bloodstream and are carried to all parts of our bodies. Eventually, the blood will enter the lungs to be “recharged.”

Explain to students that when we smell a scent with our nose, the scent is mixed with the air we breathe. Special detectors in the nose help us to figure out what the scent is. The air we breathe in then travels down the windpipe which leads to the lungs. Once in the lungs, the windpipe divides into two smaller pipes. These pipes keep dividing and get smaller and smaller until they branch into every part of the lungs. At the end of each pipe there are tiny sacs. In these sacs are tiny blood vessels. The air we breathe in with the scent eventually enters these blood vessels and recharges them. The blood then goes into the heart. From there it is pumped out to the rest of the body. The blood travels around the body in tubes called arteries, veins and capillaries. At one point during the blood's journey it must pass through the kidneys to be cleaned. Eventually, the blood will return to the heart, passing through to the lungs again.

Explain that when substances enter through our skin, they may just stay on the outer layer of the skin or they may seep down into the second layer of the skin, called the inner dermis. The inner dermis has millions of small blood vessels in it. Once substances enter these blood vessels, they can travel throughout the body.

3. Tell students that they will be learning about unsafe circumstances that might result in hazardous substances being ingested, inhaled, or absorbed through the skin.
4. **Ask:** Can you think of any unsafe situations that might result in someone accidentally eating or drinking a hazardous product? Refer to the section on "Ingestion." Read aloud the first item and the unsafe situation. Have students discuss what they think can happen. List their responses on the board. Complete the other items the same way. (You may want to divide the class into groups to discuss a certain product type and what can happen in the scenario.)

Ingestion

(teacher answer sheet)

Hazardous product	Unsafe situation	What can happen
Drain opener	When the doorbell rang, a bottle of drain opener was left on the bathroom floor. A baby was playing nearby.	A young child might drink it. NOTE: Drain openers are highly corrosive and should never be allowed to splash or touch skin or eyes.
Lemon furniture oil	When polishing some furniture, the cap to the bottle was lost and the polish was placed in a glass near the sink.	Someone might think the furniture oil was lemon soda or apple juice and drink it. NOTE: Children are lured by the pretty colors and scents of some products. Never underestimate what a child will eat or drink.
Pills	After having taken a variety of pills under a doctor's orders, someone placed them on a nightstand.	Young children might think the pills look like candy. People could also hurt themselves very badly by taking medicine prescribed for another person. NOTE: Medicines should never be taken unless given by an adult.
Antifreeze	After the antifreeze was changed in the car, it was thrown in the ditch in front of the house.	Pets and birds have died after drinking from puddles of antifreeze. NOTE: Animals are attracted to the sweet taste of a chemical in antifreeze called ethylene glycol. In addition, antifreeze can wash into nearby waterways and harm fish and other wildlife.

- Next, ask students how hazardous chemicals can be breathed into the lungs. Inform the class that people often get sick from working with certain chemicals in closed quarters by breathing vapors. Ask students if they know of precautions to use when working with vapor-producing substances. (Work only with good ventilation or wear a respirator.) Hazardous vapors are also created from mixing certain products such as chlorine bleach and ammonia or bleach and toilet bowl cleaners.

People breathe in fine particles, droplets, or vapors from sprays. These substances can irritate and damage the eyes, skin and lungs. They can also enter the bloodstream through the lungs and cause internal injury.

Inhalation

(teacher answer sheet)

Hazardous product	Unsafe situation	What can happen
Aerosol air fresheners/deodorizers	The smell from cooking fish was unpleasant. To eliminate the smell, all the windows and doors were closed and an air freshener was sprayed in the house.	Residents in the home may feel sick from breathing the vapors in closed quarters. NOTE: Most air fresheners and deodorizers work by either desensitizing your sense of smell, coating your nasal passage with an oily film, or masking the unpleasant odor with another odor.
Chlorine bleach and ammonia	The bathroom tile would not come clean using chlorine bleach cleanser so it was decided to mix some ammonia-based bathroom cleaner with the cleanser to make a stronger product.	Mixing chlorine bleach and ammonia releases toxic gas. NOTE: The gas, depending on amount of product used, can result in eye, throat, and nose irritations, breathing difficulty, and even death. Products should never be mixed unless specific instructions to do so are found on the product label.
Furniture stripper	Your neighbor decided to remove the paint from an old chair. He used a solvent-based stripper and started working on the chair in a small room in his garage. Rather than open the door and windows for air, he turned on the fan.	Solvents used in these products dry easily but the vapors linger in the air and are breathed unless there is good ventilation and fresh air. Using a fan in closed quarters will only recirculate contaminated air. NOTE: Not all solvents have strong enough odors to warn that you are breathing them. Possible warning signs include itchy or burning eyes and skin, coughing, nausea, headache, dizziness or sleepiness. Over-exposure can cause coma or death. The long-term hazards associated with some solvents include liver and kidney problems, birth defects and nervous disorders.

Refer to the section on “Inhalation” and follow the same procedures as in the “Ingestion” section.

- Now discuss situations where hazardous substances can be absorbed through the skin. Inform students that some substances pass through the skin into the body. For example, the organic solvent benzene, a common additive to gasoline, can be absorbed directly through the skin. Some substances can cause a burning sensation or irritate the skin. For example, oven cleaners and drain openers can be very corrosive and cause burns and irritations to the skin.

SKIN ABSORPTION

(teacher answer sheet)

Hazardous product	Unsafe situation	What can happen
Pesticides	To kill some ants in the kitchen, an insecticide was sprayed on the floor. Residents of the house had a habit of walking in their stocking feet.	The chemicals can penetrate the socks and be absorbed through skin. NOTE: The complete impact each pesticide, or any hazardous product, has on each person's health is not known—especially long term effects. Also, people have different sensitivities to different chemicals.
Degreaser (used to dissolve oil and grease)	After working on the car engine, the mechanic poured degreaser over his hands to take off the grease. The container said "Avoid skin contact" but he never bothered to read the label.	Solvents can dissolve skin oils and cause irritation and dryness. Solvents can also pass dissolved oil through skin into the bloodstream where there is a potential for damage to other parts of the body. Hands should not be washed with solvents unless specifically stated on the container. NOTE: Directions for use should always be read before using a hazardous product. Always wear protective safety glasses when working with solvents. Solvent vapors or splashing liquids can cause severe eye damage. This is a more serious problem if the user is wearing soft contact lenses since the lens can hold the vapors close to the eye.
Oven cleaner or drain opener	Although the product called for the use of rubber gloves, a housekeeper felt they were too clumsy and decided to clean the oven without them.	The hazardous substances in these products could cause the skin to burn or develop a rash. NOTE: Oven cleaners and drain openers typically contain very strong, corrosive chemicals. Rubber gloves should be worn. Any skin and eye contact should be washed immediately and thoroughly with water.

Refer to the section on "Skin Absorption" and follow the same procedures as in the "Ingestion" section.

7. Discuss with students the importance of reading product labels and following all safety precautions. If the label calls for safety equipment, make sure it is worn. **Ask:** If a product label says "Keep out of eyes," what safety precautions should be followed? (Wear protective safety glasses; pour carefully, and avoid splashing.) If a product label says, "Avoid skin contact," what safety precautions should be followed? (Wear protective glasses, gloves, long pants and shirts, and heavy shoes; avoid splashing.) If a product label says "Vapor harmful," what safety precautions should be followed? (work outdoors, open a window, have a fan blowing the vapors away from you, wear a respirator).

8. Explain to students the difference between acute exposure and chronic exposure. Acute exposure is exposure to a toxic substance which occurs in a short or single time period. It can produce an immediate response from the body, such as burns, nausea, dizziness, vomiting, or death. Chronic exposure is a process by which small amounts of toxic substances are taken into the body over an extended period. It can result in central nervous system damage, liver and kidney failure, cancer, reproductive system disorders and birth defects. The cause of these responses is difficult to detect and quantify.

Questions

- Name three ways hazardous substances can enter your body.
- What is an example of an acute health effect?
- What is an example of a chronic health effect?
- Have students make a list of safety precautions for using household hazardous products. Some suggested rules:
 - *Never leave household hazardous products unattended if children or animals are present. Immediately after using hazardous items, tightly seal them and store out of the reach of children.*
 - *Always keep hazardous products in their original containers.*
 - *Never take medicines not administered by an adult.*
 - *Never use hazardous products in areas that are not well ventilated.*
 - *Never mix two products.*
 - *Never put aerosol cans near heat or flame.*
 - *Always read the label for any warnings regarding how to use, or not to use, the product.*
 - *Always wear the appropriate safety equipment if the product label requires it.*

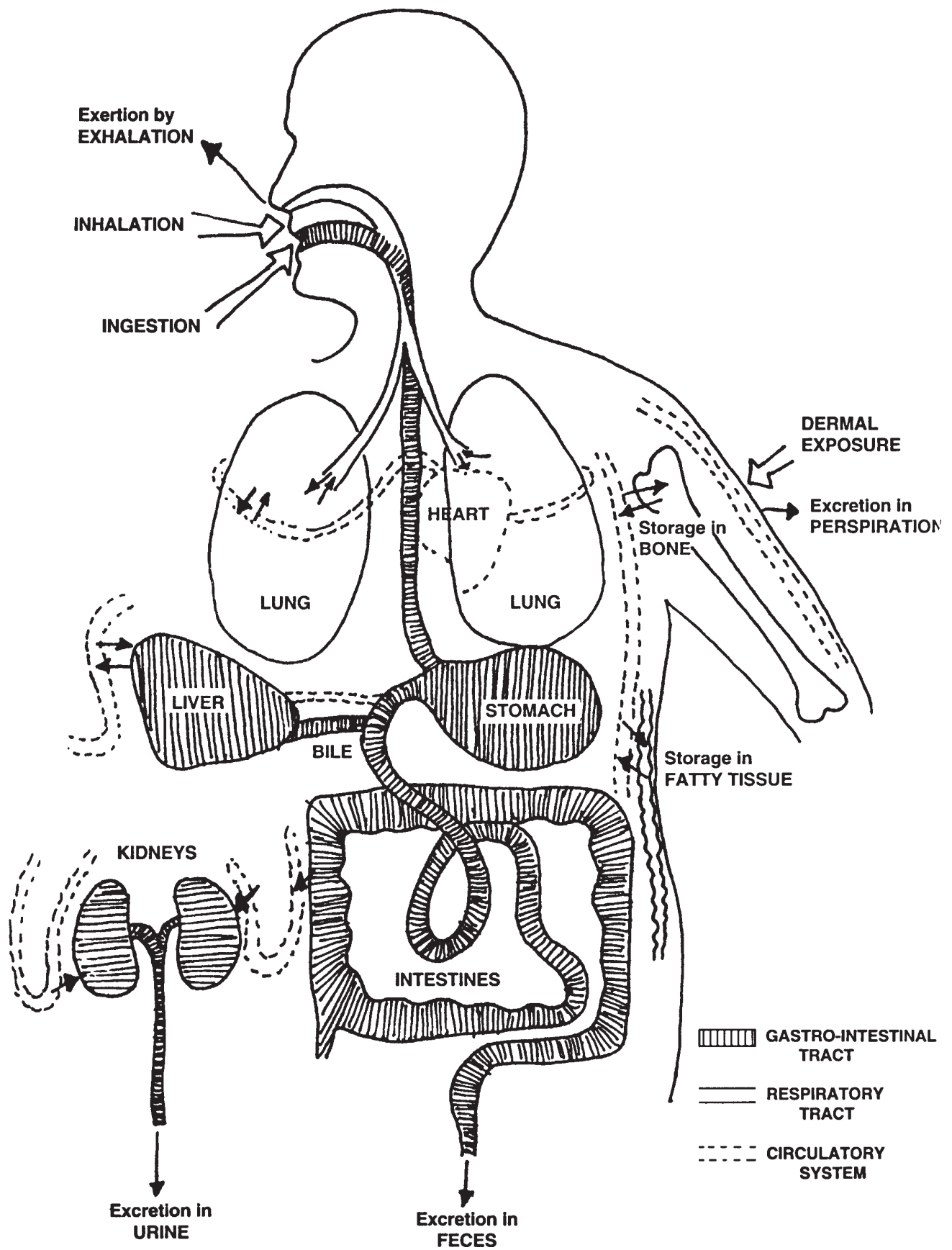
Extended Learning

1. Give students (individually or in groups) some art paper or poster board. Instruct them to draw a picture of safe or unsafe situations involving the use of household hazardous products. On the backside of the poster, have them explain what the drawing signifies. When the posters are completed, place them around the room. Have the students guess the safe or unsafe situations presented in each picture. Display the posters at a health fair or other similar event for the school or public.

Sources

Adapted from *Toxics In My Home? You Bet!*, *No Waste Anthology*, and *Teaching Toxics*.

Evidence: How is it Absorbed, Distributed, Eliminated?



Notes:

Home Hazardous Product Survey

Rationale

Many common household products are hazardous. The risk of accidental poisonings and injuries, exposure to indoor air pollution, and accidental fires can be reduced by safely storing all hazardous products.

Learning Outcome

Students, with their parents' assistance, will identify what products in their homes are hazardous and determine if they are stored safely. Then, as a class activity, students will estimate the accumulation of household hazardous products in their community.

Teacher Background

See Teacher Introductory, pages 9 to 10. A household hazardous product can be toxic, flammable, corrosive, or reactive. Many preventable accidents, injuries, illnesses and fires occur in homes due to unsafe storage of hazardous products.

Materials

- *Home Hazardous Products Survey*, one per student
- *Class Data Sheet*, one per student
- Calculator
- Letter of notification to parents, one per student. NOTE: Due to the hazardous nature of many household products, students must be required to get parental permission before conducting this survey (see attached letter to parents). Parental supervision and participation in conducting the survey are strongly encouraged.

Learning Procedure

1. Inform students' parents of the survey prior to assigning it so that they may assist in a safe home investigation. A sample letter is attached that can be modified for this use.
2. Introduce this activity by discussing the categories of household hazardous products and the properties that make them hazardous. Review the signal words on labels of hazardous products. Describe the consequences of unsafe storage of these products, including the increased risk of accidental poisonings, injuries, and fires, and exposure to indoor air pollution.
3. Copy and distribute the *Home Hazardous Products Survey* to students and require that they complete it with the help of their parents.
4. Review directions and the safety guidelines with students.

Safety Guidelines

- Keep products out of reach of children and animals. Store all hazardous products on high shelves or in locked cabinets, away from food items.
- Make sure the lids and caps are tightly sealed and child-proofed.
- Store corrosive, flammable, reactive, and toxic products on separate shelves. Pesticide products should be stored in a locked cabinet, separate from all other products.
- Be sure the containers are kept dry to prevent corrosion. Store these products where they are not likely to freeze.
- Keep products in their original containers, with the information on the label clearly legible. Never put a household hazardous product in a food or beverage container.
- Keep products away from heat, sparks, flames, or sources of ignition. This is especially important with flammable products and aerosol cans.

5. When the students have completed the *Home Surveys*, copy and distribute the *Class Data Sheet*. Write the household hazardous product categories (automotive products, home improvement products, pesticides, household cleaners, and miscellaneous) on the board. Have each student enter his or her totals for each category on the board. Total and average the numbers in each category.
6. Have each student compare his or her data from home with the class averages to determine if their figures are above or below average. Have the students compare their total number of products in each category with the class totals by creating a bar graph. Ask: What is the largest category of household hazardous products? What is the smallest?
7. If feasible, have the students determine the total number of households in your community. If this is not feasible, provide this information to the students. Possible sources include the city planning agency, the city housing department, or the local utility company. Work out the problems on the Class Data Sheet.

Questions

- In what part of the home were the greatest number of products with the signal words DANGER or POISON?
- What precautions should you take when hazardous products are stored at home?
- Why are we concerned about how these products are stored?

Extended Learning

1. Estimate the amount of household hazardous products in the community from the estimated number of products. One way would be to assume that each container holds 8 ounces and that the container was only one-quarter full. The estimated ounces of household hazardous products is calculated from the *Class Data Sheet* by multiplying the number of household hazardous products in the community ($c \times d$) by 2 ounces.

2. If you assume further that 5 percent of the household hazardous products calculated on the previous page are thrown away per month, estimate the amount in pounds of hazardous waste disposed of by your community each month and each year. (ounces/16 = pounds)
3. Discuss the validity and accuracy of the simplifying assumptions used to estimate the amounts of household hazardous waste stored and disposed of in the community. Are the assumptions realistic? How can we determine if the assumptions are realistic? Some questions to consider include: Are the totals estimated in class an accurate representation of the community? Is this data similar to every community in the area? Would people in different areas of the community use different amounts of household hazardous products?

Source

Adapted from *Home Hazardous Product Survey*

Sample letter of notification to parents

Date:

Dear Parents,

Your child has been learning about hazardous products in the home. Your child has learned:

- that signal words on a product label indicate potential toxicity. These words include DANGER, POISON, WARNING and CAUTION; and
- safety rules for the use and storage of hazardous products in the home.

The Home Hazardous Product Survey your child is bringing home is designed for you and your child to identify hazardous products in your home and to determine if they are stored safely. Because of the hazardous nature of some household products, it is very important that you provide supervision for this exercise. This activity can provide an opportunity for you to emphasize your home's safety rules.

The following safety rules should be used to determine if the products in your home are stored safely.

- Keep products out of reach of children and animals. Store all hazardous products on high shelves or in locked cabinets, away from food items.
- Make sure the lids and caps are tightly sealed and child-proofed.
- Store corrosive, flammable, and poisonous products on separate shelves. Be sure the containers are kept dry to prevent corrosion. Store these products where they are not likely to freeze.
- Keep products in their original container, with the information on the label clearly legible. Never put a household hazardous product in a food or beverage container.
- Keep products away from heat, sparks, flames, or sources of ignition. This is especially important with flammable products and aerosol cans.

When you and your child have completed the Home Hazardous Product Survey, please sign the sheet and have your child return it the next day. Thank you.

Sincerely,

Home Hazardous Product Survey

Directions: Have a parent assist you with this project; they may wish to learn, too! Search through your home to find these products. Read the labels to determine if the product you have is potentially hazardous. If it is, count the number of containers you have and write it in the space after the product. Note in the following space if the product is stored safely (see safety guidelines below). Be careful when handling these products—some may be harmful. We recommend wearing chemical-resistant gloves, such as nitrile gloves, when handling products. These gloves are available at hardware stores and other stores where safety equipment is sold. Do not spill the contents. Wash your hands thoroughly after you have handled any container that may be leaking and when you have finished with the survey.

	# of items	Stored safely yes/no		# of items	Stored safely yes/no
<u>GARAGE/BASEMENT</u>			<u>GARAGE</u>		
Paint	_____	_____	Car wax	_____	_____
Varnish	_____	_____	Motor oil	_____	_____
Paint thinner	_____	_____	Gasoline	_____	_____
Furniture stripper	_____	_____	Kerosene	_____	_____
Glue	_____	_____	Antifreeze	_____	_____
Total Number of Home Improvement Products:		_____	Total Number of Automotive Products:		_____
<u>KITCHEN/BATHROOM</u>			<u>AROUND THE HOUSE</u>		
Scouring powder	_____	_____	Air fresheners	_____	_____
Drain cleaner	_____	_____	Aerosol sprays	_____	_____
Oven cleaner	_____	_____	Household batteries	_____	_____
Floor cleaner	_____	_____	Button batteries	_____	_____
Disinfectant	_____	_____	Pool chemicals	_____	_____
Ammonia	_____	_____	Other	_____	_____
<u>LAUNDRY ROOM</u>					
Bleach	_____	_____	Total Number of Miscellaneous Products:		_____
Laundry detergent	_____	_____			
Total Number of Household Cleaners:		_____	Total Number of Hazardous Products in Your Home:		_____
<u>LAWN</u>					
Weed killers	_____	_____	Student's Name _____		
Insecticides	_____	_____			
Bug repellent	_____	_____	Parent's signature _____		
Flea spray, collars	_____	_____			
Fertilizers	_____	_____	Date _____		
Total Number of Pesticides:		_____			

Class Data Sheet

Directions: Record the class totals of household hazardous products for each category. Calculate the average number of products for each category and the total. Calculate the other questions based on information given in class.

Number of households surveyed in your class _____ (b)

Category	Class Total	Class Average
Home Improvement Products	_____/b=	_____
Pesticides	_____/b=	_____
Household Cleaners	_____/b=	_____
Automotive Products	_____/b=	_____
Miscellaneous	_____/b=	_____
TOTAL	_____/b=	_____ (c)

Number of households in your community _____ (d)

Estimate the number of household
hazardous products in your community _____ (c × d)

What Goes Around Comes Around

Rationale

The improper disposal of household hazardous wastes can threaten our health and the environment.

Learning Outcome

Students describe the environmental consequences, particularly the effects on water quality, of a variety of household hazardous waste disposal methods and identify where household hazardous wastes go when they are thrown out.

Teacher Background

See Teacher Introductory, pages 6 to 8. The improper disposal of household hazardous wastes can pollute our air, water, and soil, and harm plant and animal life. When thrown in the trash, these wastes can leach through the landfill and contaminate groundwater. If they are burned, the air can be contaminated. When poured down the drain, these wastes can destroy sewage treatment systems and leach into groundwater. Dumped into storm drains or ditches, these wastes can flow untreated into rivers, lakes and streams.

Materials

- Several old magazines or colored newspaper ads and pairs of scissors for cutting out pictures of household hazardous products; or ask students to bring in pictures as a homework assignment.
- Overhead projector
- Overhead of “Bioaccumulation”
- Overhead of “Routes into the Environment”

Learning Procedure

1. Have students look through magazines and cut out pictures of some common types of household hazardous products. Motor oil, pesticides, and paint thinner are good examples of products that are known to be persistent in the environment.
2. Explain that some hazardous wastes degrade quickly into safe substances. Explain that in this activity the primary concern is with persistent hazardous substance combinations—those that remain unchanged in the environment for long periods, or materials that combine with natural substances and pose a hazard to humans and other living organisms. Show the overhead “Bioaccumulation” and discuss the concept with students. Bioaccumulation is a process by which the biological concentration of a substance is increased through the links in the food chain. A number of smaller organisms that are contaminated are eaten by larger ones. The larger ones are eaten by an even larger one, etc. The further along the food chain, the greater the concentration. A substance that shows no effect in a small concentration could be very injurious or fatal when concentrated in the predator.
3. Have students examine the pictures of household hazardous products. **Ask:** What should we do with these products when we are through with them? What are the different ways people

dispose of them? (Recycle; put in garbage can; flush down the drain; burn in the backyard; pour out on the ground or pavement.) Tell students that although several of these disposal options are no longer legally permitted, people continue to practice them, unaware of the environmental problems caused by improper disposal of household hazardous waste. Explain that disposing of completely empty hazardous product containers in the trash is acceptable.

4. Discuss with students that part of the study of ecology is the examination and understanding of connections. Tell them that the class will now consider each of the possible ways we might dispose of household hazardous waste and how these methods could connect to our food and water supplies.
5. Tell students to consider where wastes go. Show the overhead “Routes into the Environment.” Identify the various ways a hazardous substance can travel from our homes into the environment.
6. Divide the class into several small groups and assign one of the following disposal methods to each group:
 - incineration
 - storm drain, ditch, hole in the ground
 - sink/toilet
 - garbage can
 - household hazardous waste collection

Have each group brainstorm for several minutes where the hazardous products they have pictures of might end up if disposed of by their designated disposal method. Have each group answer the following questions:

- If we dispose of the product by this method, what might happen?
 - Is there any way that wildlife might be harmed?
 - Is there any way this product could get into our drinking water?
 - Is there any way this product could get into our food?
7. Have the groups share their ideas with the rest of the class. After each group presents its ideas, discuss with the class the information from “Hazardous Products and the Environment” contained in the Teacher Introductory section.
 8. After all the options have been covered, review with the class where persistent household hazardous wastes go. **Ask:** What can we do to reduce the amount of household hazardous waste we produce? How can we eliminate or reduce the waste before it becomes a problem for us and the environment?
 9. Have students brainstorm ways that we can prevent persistent hazardous wastes from harming the environment. Have them think of solutions that they might do themselves, such as:
 - Do not buy products containing hazardous ingredients. Learn to read product labels. (For more information, see *Read the Label* activity.)
 - Use alternatives to hazardous products. (For more information, see *Is There a Safer Alternative?* activity.)
 - Buy only as much of a hazardous product as you need to do the job at hand.
 - Use the product up for its intended purpose or find someone who can use it.
 - Find out if the product is accepted for recycling in your area. Several household hazardous products can be recycled, such as used motor oil, automobile batteries, and antifreeze.
 - Find out if there is a household hazardous waste collection in your area and take the product to the collection facility. If there is no collection facility available, save the product for an upcoming collection.

Questions

- What is a persistent substance?
- Why are persistent hazardous substances of particular concern in waste management?
- What is bioaccumulation?
- What can happen to a hazardous substance if it is burned? dumped on the ground? poured down the drain? put in the trash?
- What is a household hazardous waste collection?
- How can we reduce the amount of household hazardous waste we produce?

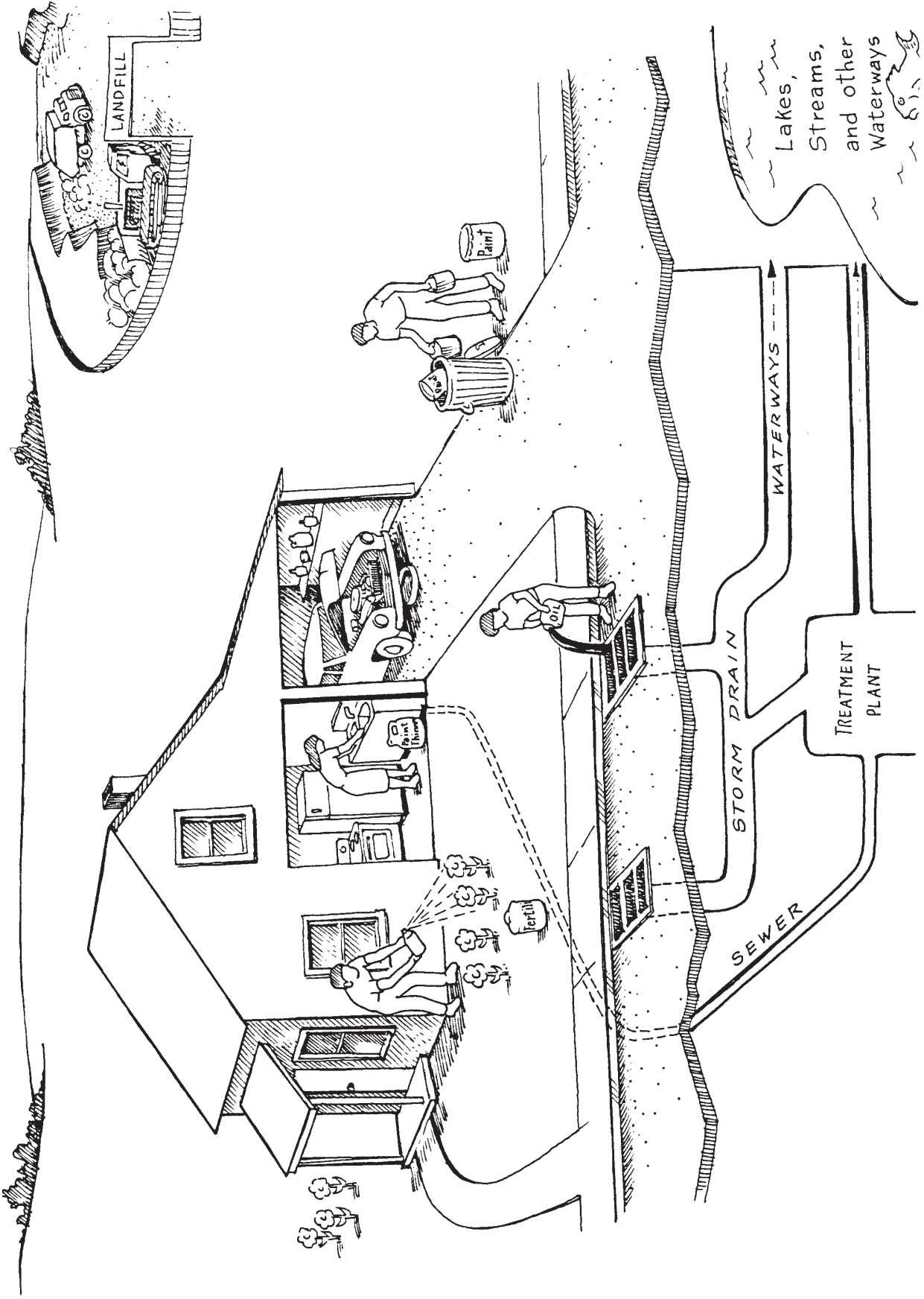
Extended Learning

1. Research recycling outlets in your community that accept hazardous products from households (such as automobile batteries, silver oxide or mercury-oxide batteries, paint, motor oil, etc.) by contacting local government, recycling centers, retailers, and environmental organizations. Produce a list of these outlets for the community. Publicize the list through local media, including school and environmental club newsletters.
2. As a class assignment, contact state officials to find out about collection programs in your area. In Kansas, contact your Department of Health and Environment district office. In Missouri, contact your regional Department of Natural Resources office.
3. Find out if any streams and rivers in your state are under fish advisories. If advisories have been issued, find out why.

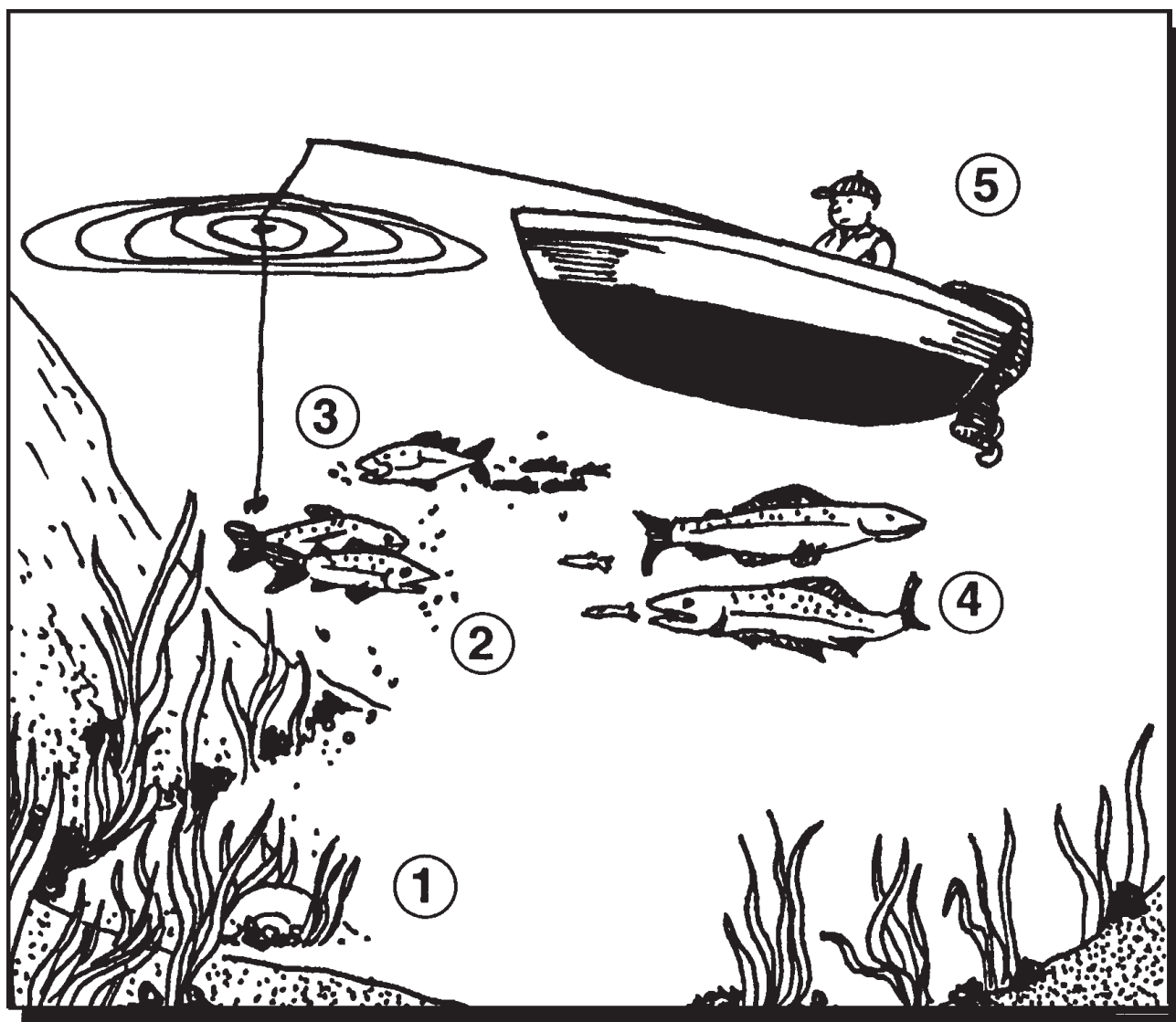
Source

Adapted from *A-Way With Waste*

Routes to the Environment



Bioaccumulation



1. Some substances (chlordane will be used in this example) do not dissolve and do not break down easily. They stick to plants and particles in the water.
2. Small invertebrate animals such as aquatic insects and crustaceans eat plants contaminated with chlordane or absorb from the water.
3. Small fish (crappie, bluegills, perch) eat smaller animals.
4. Trout and bass eat small invertebrates and smaller fish. Fish (both large and small) absorb chlordane directly from the water.
5. People catch and eat fish containing chlordane. Substances like chlordane that bioaccumulate collect in the fatty tissue and organs in humans.

Notes:

Is There a Safer Alternative?

Rationale

One of the best means of avoiding exposure to household hazardous products is to use safer alternatives whenever possible.

Learning Outcome

Students identify safer alternatives for some household hazardous products and determine where they can be obtained. Students also test some safer alternative recipes and examine what influences people when choosing a product.

Teacher Background

See Teacher Introductory, pages 9 to 10. There are a variety of alternatives to household hazardous products, especially cleaning products. Alternatives include homemade products which are typically less expensive and are easy to make. However, they may require more elbow grease and a more rigorous cleaning schedule to be as effective as commercial products. Deciding what cleaning products to use is a personal choice. One must weigh the advantages and disadvantages associated with each product.

Materials

- Advertisements from magazines and newspapers showing household hazardous products
- Copies of *Safer Alternatives For Hazardous Products*, one per student
- Several rags
- Several containers
- Ingredients: Worcestershire sauce, lemon, salt, vinegar, cornstarch, potato (peeled), baking soda, toothpaste
- Brass item
- Copper item (pennies, pots with copper bottoms)
- Decals stuck on glass or wood item
- Rusty tinware
- Gold or silver item

Learning Procedure

1. Ask students to name some potentially hazardous products used in the home to:
 - (1) clean and freshen the house
 - (2) take care of the yard and garden

List their responses on the board under “1” and “2.”

2. Display advertisements or pictures of household hazardous products. Have students observe the packaging and slogans used by each company to sell their product. Ask students to recall any advertisements they have seen on TV. What was the slogan, jingle, or gimmick used to sell that particular product? Why might a consumer buy these hazardous products? Do the advertisers mention any potential hazards to human health and the environment? Discuss.
3. Explain to students that many household hazardous products that we purchase are not always necessary and are sometimes expensive. There are safer alternatives for some of these products, especially cleaning products, available at most grocery stores.
4. Ask students if they can think of alternatives for any of the products listed on the board. Write their answers next to the corresponding hazardous product.
5. Distribute a copy of the *Safer Alternatives for Hazardous Products* to each student. Read through the substitutes with the class. **Ask:** Can you think of additional substitutes for the categories mentioned? Are any of these surprising? Can these substitutes be easily purchased? Where? Are any of these substitutes used in your home already? Do you think your family would be willing to try an alternative? If “no,” why not?
6. Using the information from the *Safer Alternatives for Hazardous Products*, set up stations around the room with the recipes, ingredients, and other materials needed to perform the task. Tell students that they are now going to test some of the recipes. Have students break into several small groups and rotate through the cleaning stations. Have each group select a member to write down their comments on the effectiveness of each safer alternative recipe. Ask groups to rate the effectiveness of each recipe on a scale of 1 to 5.
7. After the groups have completed the cleaning stations, ask each group to report to the class their results from using the safer alternative recipes.

Questions

- What are the advantages of using the safer alternatives?
- What are the disadvantages of using the safer alternatives?

Extended Learning

1. Create advertising for safer alternative recipes. These can be in the form of posters, essays, or flyers. Display them at school and at home.
2. Have students keep a diary of all the hazardous products they use in a week. Have them consider the impact on their lives if they were asked to live without them. Which ones could they replace with a safer alternative product or recipe? Which ones can they recycle in the community?

Sources

Adapted from *Toxics In My Home? You Bet!* and *No Waste Anthology*.

Safer Alternatives For Household Hazardous Products

The following is a list of safer alternatives for some household hazardous products. Generally, the ingredients can be bought in grocery stores.

Aerosol Spray

- Use non-aerosol, pump-type sprays.

Air Fresheners

- Simmer cinnamon and cloves.
- Burn scented candles.
- Buy or make your own potpourri from your favorite herbs and spices. Place the potpourri in a small basket or jar or in small sachet bags.
- Baking soda is good for odors in the refrigerator, cat box and drains.

Aluminum Cleaner

- To remove stains and discoloration from aluminum cookware, fill cookware with hot water and add 2 tablespoons cream of tartar to each quart of water. Bring solution to a boil and simmer 10 minutes. Wash as usual and dry.

Ant Control

- If you can find a hole where ants are entering the house, squeeze the juice of a lemon in the hole or crack. Then slice up the lemon and put the peeling all around the entrance. Seal the entrance, if possible.
- Grow spearmint around the border of your home to deter ants and the aphids they carry.

Brass Cleaner

- Clean and polish unlacquered brass to a shine with a soft cloth dampened with Worcestershire sauce. The acid-salt combination in the Worcestershire sauce eats away the tarnish.

Bug Spray

- Place screens on windows and doors.

Chemical Fertilizers

- Compost
- Mulch
- Dried coffee grounds, bonemeal and wood ashes

Copper Cleaner

- Use a slice of lemon sprinkled with baking soda. Rub copper with the lemon slice and rinse with water and dry.

Decal Remover

- Vinegar can be used to remove price tags and other decals from glass, wood and china. Paint the label or decal with several coats of white vinegar. Give the vinegar time to soak in and after several minutes the decal can be rubbed off.

Drain Openers

- Pour boiling water down the drain. Do this every week for preventive maintenance.
- Use a plunger or a plumber's snake.

Fib Control

- Use non-toxic adhesive fly paper.

Glass and Window Cleaners

- Mix 3 tablespoons cornstarch and $\frac{1}{2}$ cup white vinegar into 1 gallon warm water. Apply to surface and wipe dry.

Gold and Silver Cleaner

- To clean tarnish off gold and silver (not silver plate), use toothpaste and a soft-bristled toothbrush or cloth. Rinse with clean warm water and polish dry.

Oven Cleaners

- Put a sheet of aluminum foil on the floor of the oven, underneath but not touching the heating element. Although this may slightly affect the browning of the food, the foil can be easily disposed of when soiled. Clean up the spill as soon as it occurs.
- While the oven is still warm, sprinkle salt on the spill. If the spill is completely dry, wet the spill lightly before sprinkling on salt. When the oven cools down, scrape away the spill and wash the area clean.

Oil-Based Paint

- Use water-based paints instead. They are less hazardous than oil based paint and use water as the cleanup agent.

Rat and Mouse Poison

- Use mechanical-snap mouse traps.

Rust Remover

- To remove rust from tinware, rub with a peeled potato dipped in a mild abrasive such as baking soda or salt.

Scouring Powder

- Sprinkle baking soda like you would scouring powder. Rub with a damp sponge. Rinse thoroughly.
- Use scouring powders that do not contain chlorine bleach.

Snail/Slug Bait

- Place overturned clay flower pots near the shady side of a plant. Rest one edge on a small twig, making sure there is enough room for the slugs and snails to crawl under the rim. They will take shelter there during the warmest part of the day and can then be collected and removed.
- Protect young plants by encircling them with a tin can with both ends removed. Push the bottom end of the can into the soil around the stem.

Spot Remover

- Rinse or sponge blood and chocolate stains immediately with club soda. Repeat as necessary. Wash usual.

Toxic-Free Bingo

Rationale

There are a variety of alternatives to household hazardous products, especially cleaning products. These alternatives are typically less expensive and are easy to make.

Learning Outcome

Students identify and match safer alternatives to household hazardous products.

Materials

- 4 × 4 grids (bingo cards), one per student
- Copies of *Safer Alternatives for Hazardous Products*, one per student
- Beans or small markers
- Master cards
- Small box or container for drawing master cards

Learning Procedure

1. Tell students that they are going to play a game called Toxic-Free Bingo. Pass out a grid and a handful of markers to each student. [You may want to complete a master set of grids for the class. Each square is filled with a hazardous product from the *Safer Alternatives for Hazardous Products* sheet. No word(s) may be used more than once on a grid. You can also choose to let the students complete their own grids, following the same directions as above.]
2. Draw a card (with the safer alternatives on them) from a box or container. Read it aloud. Students should then look for the hazardous product on their grid that can be replaced with the clue (the safer alternative). Example: Card drawn is “baking soda.” Students should place a marker on scouring powder. Students may only choose one hazardous product. They may refer to their information sheet on safer alternatives. The object is to get four in a row; vertically, horizontally, or diagonally. Four corners also wins.
3. After the game, students can switch cards and play again. Keep card for future games.

Sources

Adapted from *Toxics In My Home? You Bet!* and *No Waste Anthology*.

Toxic-Free Bingo

Toxic-Free Bingo Master Cards

Cut each rectangle and place in a small box or container. The item in parentheses is typically a hazardous product. The item above it is a recommended safer alternative. The instructor reads the safer alternative.

clay flower pots (snail/slug bait)	Worcestershire sauce (brass cleaner)
pump-type sprayers (aerosol sprays)	boiling water (drain opener)
potpourri (air freshener)	water-based paint (solvent-based paint)
compost or mulch (chemical fertilizer)	lemon slice and baking soda (copper cleaner)
spearmint (ant control)	vinegar (decal remover)
nontoxic adhesive paper (fly control)	cornstarch, vinegar and water (glass and window cleaner)
salt on spills (oven cleaner)	cream of tartar (aluminum cleaner)
mouse traps (rat and mouse poison)	peeled potato and salt (rust remover)
baking soda (scouring powder)	toothpaste (gold and silver cleaner)
screens (bug spray)	club soda (spot remover)

Notes:

More Than Meets The Eye

Rationale

Protecting groundwater is important as it is a vital and irreplaceable source of drinking water in the United States. Fifty percent of Kansans and Missourians depend on groundwater sources for their drinking water.¹

Learning Outcome

Students discover how water is stored in the ground and how difficult, if not impossible, it is to purify groundwater once it is contaminated.

Teacher Background

See Teacher Introductory, pages 6 to 8. Groundwater contamination occurs when water infiltrates into the ground and transports substances to the groundwater zone. Hazardous substances on or under the ground surface may be carried by the movement of water through the soils until they reach groundwater. Large volumes of drinking water can be contaminated by small quantities of certain hazardous substances.

Materials

- Several household sponges cut into quarters
- Red food coloring
- Eye dropper
- Several glasses of water
- Containers to catch water
- Overhead projector
- Overhead of “Water in Soil”

Learning Procedure

1. Have students break into several small groups. Pass out a piece of sponge, a glass of water, and a container to each group.
2. Tell students that the water they drink and cook their food in may come from underground. **Ask:** Do you think the ground is solid? If it is solid, how can water be stored in the ground?
3. Tell students to examine their sponge. **Ask:** Are the sponges solid? Can they hold water?
4. Have a student in each group hold a sponge piece over their container. Have another student slowly pour water over the sponge until it is saturated and the water begins to drip into the container. **Ask:** Is there water in the sponge? If so, where is it?
5. Explain that the water is filling the “air spaces” in the sponge and that the sponge is like the ground. Show the overhead of “Water in Soil.” Point out the air spaces available in the soil. Explain that this is how groundwater is stored. Tell students that some soils are better than others at holding water. For example, sandy soils do not hold water as well as clay soils. Special underground areas that hold lots of water are called aquifers.

6. Tell students that the saturated sponge represents an aquifer. Add one or two drops of red dye onto each of the saturated sponge pieces. Explain that the dye represents hazardous substances (such as weed and bug killers, gasoline, or oil from leaking tanks) that if improperly disposed of, can contaminate groundwater. Tell students to observe how the “contaminant” begins to disperse throughout the “aquifer.”
7. Have students squeeze the water from the sponges into their containers and note its color. Have them attempt to clean the “aquifer” by resaturating the sponge with clean water and resqueezing. Tell them to keep track of the number of times necessary to do this before the water from the sponge becomes clear again.

Questions

- What is groundwater?
- What is an aquifer?
- Where does drinking water come from?
- What does contaminate mean?
- What ways might household hazardous products get into groundwater?
- What can we do to keep household hazardous products out of our drinking water?

Extended Learning

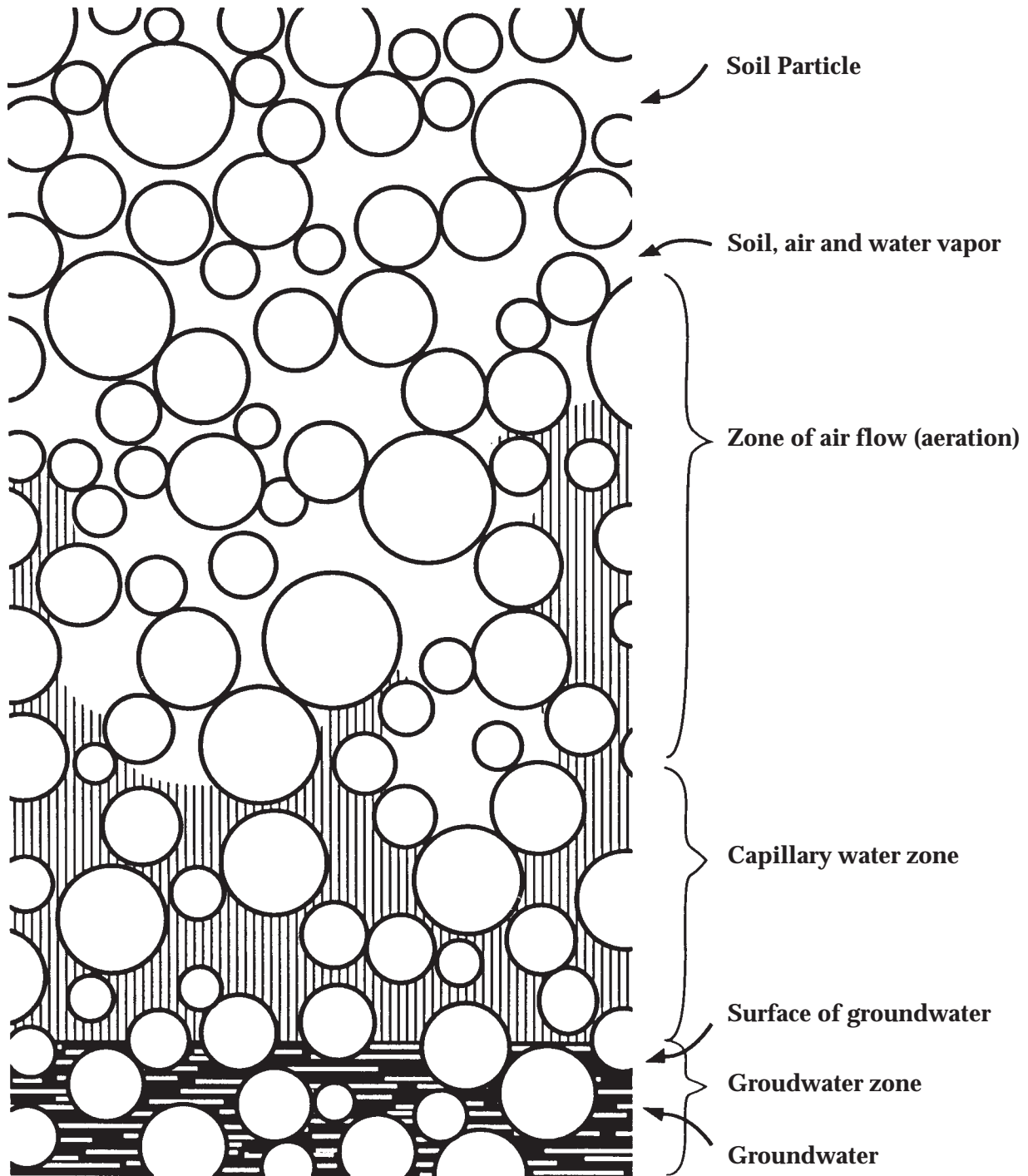
1. Determine where your drinking water comes from and where your wastewater goes. Investigate the possible effects on water quality of dumping used motor oil on the ground, into a storm sewer, down a basement drain, into the trash destined for the landfill, and taking it to a recycling center for used motor oil.
2. Tour the water utility and wastewater treatment plant.

Sources

¹Kansas Water Office, 109 SW 9th St., Suite 300, Topeka, KS 66612 and Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

Adapted from *A-Way With Waste*.

Water in Soil



Zunker's classification of soil moisture.

Working For The Environment

Rationale

Opportunities for careers in environmental management and protection, particularly in solid and hazardous waste management, are expanding.

Learning Outcome

Students discover career opportunities in environmental management and protection. They recognize that a career in environmentally-related work is one way to influence the environmental problems and solutions facing society.

Teacher Background

As awareness and knowledge about environmental degradation resulting from past hazardous waste disposal practices have increased, both federal and state legislatures have passed Superfund legislation mandating the cleanup of hazardous waste sites. The U.S. Congress's Office of Technology Assessment estimates the number of sites on the federal Superfund list will grow to 10,000 with an estimated cleanup cost of \$500 billion over the next 50 years.¹

Materials

- Copies of the *List of Environmental Management and Protection Occupations and Publications*, one per student

Learning Procedure

1. Write the number \$500,000,000,000 on the board. Tell students this is the estimated cost of cleaning up hazardous dumpsites over the next 50 years. Tell them that jobs related to cleanup activities are expanding. In addition, government agencies are emphasizing technologies that reduce, recycle, and treat all types of hazardous waste. Industries are trying to develop technologies that generate less hazardous waste. Other organizations are working to educate consumers about hazardous waste issues.
2. Have the class brainstorm a list of environmental management and protection occupations. Examples include environmental attorney, toxicologist, natural resource manager for a government agency, and an environmental engineer.
3. Pass out a copy of the *List of Environmental Management and Protection Occupations and Publications* to each student. Combine the list of occupations with the one just generated by the class. Have each student choose an occupation of interest. (Younger students may want to work in small groups.)
4. Give students the assignment of finding as many of the publications listed on the sheet as possible in the school library. If your school does not have or cannot obtain any of these publications, other sources are:
 - Department of Health and Environment
 - Department of Natural Resources
 - Department of Wildlife and Parks
 - Department of Conservation
 - Municipal (city or county) Engineering Department

- Private or public waste haulers or recyclers
- Private waste management companies
- Public library

Look in the Yellow Pages of your local telephone book for addresses.

5. Have students research a specific environmental career using the listed publications and other appropriate sources, such as newspaper articles or the classified ads in the Sunday newspaper. Have them prepare a report on their research that includes information on the following:
 - a. What do people in this profession do? Why is their work important?
 - b. How do people begin careers in this field?
 - c. In what kinds of companies and organizations are professionals in this field employed?
 - d. How does this occupation work to protect the environment?
6. After the reports are completed, have students share their findings with the class.

Questions

- Why are the number of jobs in environmental professions increasing?
- What are the training and educational requirements for these different types of environmental professions?

Extended Learning

1. Invite an environmental professional to speak to your class.
2. Have students follow a product from its creation to its ultimate disposal and investigate the jobs associated with this process. For example, chemists create a hazardous substance; chemical engineers and technicians design the processes which generate it. A toxicologist will test the substance to determine its potential for long term harm to humans and animals. Transporting it will entail certain jobs. Finally, a hazardous waste engineer or biochemist might be involved with its disposal.
3. Have older students identify companies and organizations in your area which employ environmental professionals. Have them research the descriptions of the environmental jobs these companies offer.

Sources

¹Brian Keating and Dick Russel, "Inside the EPA," E Magazine, July/August 1992, p. 33.

Adapted from *A-Way With Waste*

Environmental Management and Protection Professions and Publications

Professions

Attorney—environmental issues specialization

Biologist—hazardous waste inspection, conservation biologist

Chemical Engineer—hazardous waste management

Chemist—hazardous waste technology, product formulation

Civil Engineer—hazardous waste inspection

City/County Planner—waste reduction and recycling management

City/County Recycling Education Coordinator—recycling education

Consultant—solid and hazardous waste management

Environmental Educator—waste management and recycling

Environmental Engineer—solid waste management, wastewater management

Environmental Planner—waste reduction, recycling, environmental quality assessment

Environmental Technician—field investigation

Fisheries Manager—spill response, habitat assessment

Hydrologist—solid waste reduction, water quality assessment

Legal Assistant—solid waste management practices

Natural Resource Manager—state government agency, wildlife management

Recycler—private business and industry

Research Assistant—recycling programs, waste management

Sanitary Engineer—solid waste management

State Regulator—enforcement of environmental laws

Technical Writer—environmental impact assessment

Toxicologist—study of poisonings

(List others here)

Publications

Amicus Journal

BioCycle-Journal of Waste Recycling

Buzzworm

Chemical and Engineering News

Common Sense Quarterly

E Magazine

Environmental Action

Environmental Opportunities

Environmental Protection

EPA Journal

FDA Consumer

HazMat World

Health and Environmental Digest

Inside Environment

Journal of Pesticide Reform

MSW Management

Pollution Engineering

Pollution Prevention Review

Recycling Today

Resource Recycling

Science

WasteTech News

Worldwatch

Notes:

What Your Home Haz

Rationale

The study of household hazardous products is a timely issue that can enhance many educational subjects, including health, biology, geology, chemistry and consumer studies.

Learning Outcome

Students review the terminology and concepts learned in the previous activities.

Materials

- Large sheet of paper (or use chalkboard)
- List of questions
- A bell, coffee can and spoon, or some other way for teams to signal that they have an answer

Learning Procedure

1. On the board or a large pad of paper set up a gameboard following the format of the TV show, *Jeopardy* (see below). The categories are: Daily Living, Health Effects, Disposal, Safer Substitutes and Environmental Effects. Write the category headings across the top and then the question values, 10 to 50 points, down the side for each category.

Daily living	Health effects	Disposal	Safer substitutes	Environmental effects
10	10	10	10	10
20	20	20	20	20
30	30	30	30	30
40	40	40	40	40
50	50	50	50	50

2. Divide the class into two teams. Decide whether to allow the members of a team to confer before answering a question. An alternative procedure is to have each team's players form a line, with each player getting a turn to answer a question.
3. Toss a coin to determine which team begins. The beginning team selects a category and point value (for example, "Disposal for 30"). Read a question for that category and point value (see "Questions").
4. The first team to signal gives its answer to the question. If the answer is incorrect, the team loses that point value. Then the other team is given a chance to provide the correct answer. You are encouraged to set a time limit for receiving answers.
5. When a correct answer is given for a question, cross out that space on the game board. Add the points to the team's score. Have the player who answered correctly select the next question by choosing a category and point value (for example "Health Effects for 10"). Continue until all the questions on the gameboard have been selected or your time period runs out.

6. You may direct players who provide correct answers to sit out from the game so that all players have an opportunity to answer a question.
7. The team with the most points wins.

Notes

- The point values assigned to each question are suggested values. Please feel free to change the point values to reflect the informational emphasis you have used in your classroom.
- There are more questions provided below than are needed for one game. We encourage you to select or develop questions appropriate for your class.

What Your Home Haz Questions

Points DAILY LIVING

- 10 Name the five categories of household hazardous products. *Automotive, home improvement, cleaners, pesticides, miscellaneous.*
- 10 Name two hazardous products often found in our homes. *Accept all reasonable answers.*
- 20 Name one thing that could happen if hazardous products are not stored safely. *Accidental poisoning, fire, indoor air pollution.*
- 20 What household product may work by deadening your nasal nerve endings so you cannot smell? *Air fresheners.*
- 30 Name the four properties of household hazardous products. *Toxic, flammable, corrosive, reactive.*
- 30 You have some leftover window cleaner. What should you do with it? *Use it up or give it to someone who can.*
- 40 Name three words found on product labels that indicate a product is hazardous. *Danger, poison, warning, caution, irritant, caustic, flammable, combustible, or explosive.*
- 40 It is your turn to clean the stubborn stain in the bathtub. Why should you never add ammonia to strengthen the power of the chlorine-based scouring powder you are using? *Ammonia plus chlorine produces a poisonous and potentially lethal gas.*
- 50 Why should aerosol spray cans be stored away from heat or flame sources? *They can explode when exposed to high temperatures.*
- 50 Name four careers in environmental management and protection. *Accept all reasonable answers.*

HEALTH EFFECTS

- 10 Define “toxic.” *A substance that can cause injury, illness, or death*
- 10 How long does it take an acutely toxic substance to produce adverse health effects? *Immediately or in a very short time period.*
- 20 How can you protect your eyes from splashes when pouring hazardous liquids like bleach? *Wear protective goggles.*
- 20 What is chronic exposure to a hazardous substance? *Exposure to small amounts of a toxic substance over a long period of time.*

- 30 Name three ways hazardous substances can enter into your body. *Inhalation, ingestion, skin contact/absorption.*
- 30 What would happen if you touched a hazardous product that is corrosive or caustic? *It would burn and destroy your skin where contacted.*
- 40 Name two of the actions you should take when the directions on a product label instruct you to avoid breathing vapors. *Work outdoors, open a window, have a fan blowing the vapors away from you, or wear a respirator.*
- 40 While changing the antifreeze in her car, the woman spilled some on the driveway. Why should it be cleaned up immediately? *Children, animals and birds can die from drinking puddles of antifreeze.*
- 50 While you are babysitting, the child has swallowed a toxic substance. What should you do? *Call the Poison Center, the local emergency room, or trauma center.*
- 50 Why are aerosol sprays potentially harmful to your health? *You could breathe the particles when they are dispersed; the can could explode when near source of spark or heat.*

DISPOSAL

- 10 You helped change the motor oil in the family car. What should you do with the used motor oil? *Recycle it by taking it to your nearest collection point for used oil, such as an automotive center.*
- 10 Name one household hazardous product that can be recycled. *Includes motor oil, automotive and household button batteries, and maybe paint.*
- 20 When is a product hazardous? *When its use or disposal poses a threat to your health or the environment.*
- 20 What is leachate? *Liquid material that runs off or seeps down from the surface into groundwater and surface water. Leachate may contain hazardous materials.*
- 30 When something is dumped into a storm drain, where does it go? *Directly to surface waters such as rivers, lakes, creeks, or streams, or the wastewater treatment plant. It depends on locality.*
- 30 Where does hazardous waste go when it is placed in the trash? *Trash collectors take it to the municipal landfill, or depends on your locality.*
- 40 Where do wastes and water go when flushed into the sewage system? *To the local wastewater treatment facility, or depends upon your locality.*
- 40 Where do wastes and water go when flushed into a septic system? *Into the septic tank and then into the drainage field.*
- 50 What can happen when hazardous waste is placed in the landfill? *Any liquids, heavy metals, and water-soluble chemicals may be carried as leachate into the groundwater and surface water, thereby contaminating them.*
- 50 What is a household hazardous waste collection? *A one-time event or ongoing community program to collect and provide proper disposal for unwanted or unusable household hazardous products.*

SAFER SUBSTITUTES

- 10 Name two advantages of using safer alternatives. *Accept all reasonable answers.*
- 10 Name two common kitchen products that can be used as safe household cleaners. *Includes baking soda, salt, vinegar, cream of tartar, club soda, lemon juice.*
- 20 You painted your room using latex paint. What solvent will you use to clean your brushes and you? *Water.*
- 20 What safe bathroom product can be used to clean and polish gold? *Toothpaste.*
- 30 You borrowed your sister's new blouse and spilled chocolate ice cream on it. What kitchen product can remove the stain safely? *Club soda—soak before washing.*
- 30 Name a safer alternative to using an aerosol can. *Includes using a pump spray bottle, spray gun, paint brush.*
- 40 You have many natural predators around your home which help control pests. Name two of them. *They include frogs, spiders, ladybugs, praying mantis, dragonflies, birds and cats.*
- 40 Name a safer alternative for removing rust. *Peeled potato and salt.*
- 50 Name a fragrant herb which will repel ants when planted around your home. *Pennyroyal or spearmint.*
- 50 You are a contestant in a supermarket contest to find nonhazardous products for household cleaning. Name four of the words found on labels which tell you a product is hazardous. *Danger, poison, warning, caution, irritant, caustic, flammable, combustible, radioactive or explosive.*

ENVIRONMENTAL EFFECTS

- 10 What does flammable mean? *Can be set on fire easily.*
- 10 What do the letters "EPA" stand for? *Environmental Protection Agency.*
- 20 Why do small children and animals want to taste and drink antifreeze, even though it is poisonous? *Because it has a sweet taste and attractive color.*
- 20 What does reactive mean? *Can detonate or explode through exposure to heat, sudden shock pressure or incompatible substances.*
- 30 What is a "food chain?" *The link between organisms in an ecosystem that begins with the primary producers (plants) and the organisms that eat them and each other (animals, fungi, microorganisms).*
- 30 What is a solvent? *A substance that dissolves another substance.*
- 40 What is groundwater? *Water beneath the earth's surface at varying depths.*
- 40 What is an aquifer? *An underground geological formation in which the cracks in rock, sand, or gravel are filled with water.*
- 50 What is a persistent chemical? *A chemical that remains unchanged in the environment for long periods.*
- 50 Define bioaccumulation. *The concentration of a particular substance in the bodies of organisms, increasing with the animal's level in the food chain.*

Extended Learning

1. Have students create additional questions for each other or for younger students. Keep a list of these questions, along with their assigned point values, at right.
2. Have a “Household Hazardous Waste Knowledge Bee,” possibly including additional classrooms.

Sources

Adapted from *What Your Home Haz* and *Toxics In My Home? You Bet!*

Notes:

Glossary

Acute health effects

Signs and symptoms that result from a single exposure to a hazardous substance, such as headaches, dizziness, skin or eye irritation, vomiting, coma, or death. Symptoms usually occur shortly after exposure and may range from minor to severe.

Aquifer

An underground geological formation in which the cracks in rock, sand, or gravel are filled with water.

Bioaccumulation

The process by which the biological concentration of a substance is increased through links in the food chain. A number of smaller organisms that are contaminated are eaten by larger ones. The larger ones are eaten by an even larger one, etc. The further along the food chain, the greater the concentration. A substance that shows no effect in a small concentration could be very injurious or fatal when concentrated in the predator.

Carcinogen

Capable of producing cancers in humans and animals.

Chronic health effects

These effects are gradual and occur through repeated exposure to hazardous substances over an extended period of time. Examples include cancer, liver or kidney damage, birth defects, or central nervous system damage.

Combustible

Any substance that will burn. Usually refers to solids that are relatively difficult to ignite and to liquids that have a flash point at or greater than 100°F but below 200°F.

Corrosive

Any substance that can burn and destroy living tissues, or which causes a severe corrosion rate in steel or aluminum.

EPA

The Environmental Protection Agency, the federal agency responsible for the enforcement of all federal regulations having to do with air and water pollution, radiation and pesticide hazard, conservation, ecological research and solid waste disposal.

Flammable

Any substance that can be easily set on fire. Flammable liquids have a flash point less than 100°F.

Flash point

The minimum temperature at which a liquid or solid gives off sufficient vapor to form an ignitable vapor-air mixture near the surface of the liquid or solid as determined by a specified method.

Groundwater

Water beneath the earth's surface at varying depths.

Hazardous materials

Chemicals that pose a significant threat to human health and/or the environment.

Hazardous waste landfill

A landfill designed to accept hazardous waste.

Household hazardous product

A product, which is corrosive, reactive, flammable, or toxic, purchased by an individual for private use.

Household hazardous waste collection

A one-time event or ongoing community program to collect and provide proper disposal for unwanted or unusable household hazardous products.

Ignitable

Solids that catch fire easily and burn so rapidly that they create a serious health hazard, and liquids that have a flash point less than 140°F.

Irritant

Any substance which inflames living tissue by chemical action at the site of contact, causing pain or swelling.

Landfill

Facility in which solid waste from municipal and/or industrial sources is disposed; sanitary landfills are those landfills that are operated in accordance with current environmental protection standards.

Leachate

The liquid forming when water infiltrates through the soil covering a landfill and percolates through the waste, picking up a variety of suspended and dissolved materials from the waste.

Municipal sewer system

A type of sewage system in which underground pipes collect wastes from residences, office buildings, businesses, and schools that eventually drain into a wastewater treatment plant. The degree of treatment depends on the type of system. After treatment, the effluent is discharged into lakes, streams, or rivers.

Mutagen

A substance which alters the genetic structure of a cell, especially reproductive cells.

Organic solvent

A dissolving medium comprised of compounds of carbon, except for certain rocklike or earthy carbon-containing substances that are usually classified as inorganic compounds such as calcium carbonate, carbon dioxide, carbon monoxide and cyanides.

Persistent material

A material that degrades very slowly, if at all.

Polychlorinated biphenyls (PCBs)

A mixture of chemicals that are clear to yellow oily liquids or solids. They have been used in insulating fluids of electrical systems. PCBs are suspected carcinogens.

Reactive

Any substance which can cause an explosion when subject to heat, sudden shock, pressure or contact with an incompatible substance.

Recycle

To separate a given waste material from other wastes and to process it so that it can be used again in a form similar to its original use.

Reduction

The process of decreasing the amount of waste generated at each step of product development or use.

Septic system

A type of sewage system in which the solid materials settle out in a septic tank and are gradually broken down by bacteria. The liquid sewage flows out into the drainfield or lagoon where, ideally, it is broken down by soil bacteria. Most often, a septic system serves an individual home.

Solvent

A material that can dissolve other materials to form a uniform single-phase mixture. Water is a common solvent.

Storm drains

Systems of ditches, culverts or underground pipes that collect storm water runoff from impervious urban surfaces, such as streets, roofs, driveways and parking lots. Usually the pipes empty the untreated water directly into lakes and rivers.

Teratogen

A substance that produces a physical defect in a developing fetus.

Toxic

Any substance that can cause injury or death if eaten, inhaled or absorbed through skin.

Volatilization

Loss of a substance through evaporation.

Waste water treatment plant

A facility that receives wastewaters (and sometimes storm drain runoff) from domestic and/or industrial sources, and by combination of physical, chemical, and biological processes reduces (treats) the wastewaters to less harmful byproducts. After treatment, the effluent is discharged into lakes, streams, or rivers and solids (sludge) are dried and applied to nonagricultural lands.

Notes:

Resources

Environment

50 Simple Things You Can Do to Save the Earth (1989), by Earthworks Group, published by the Earthworks Group, Berkeley, CA.

The Amicus Journal, published quarterly by the National Resources Defense Council, 122 East 42nd St, Room 4500, New York, NY 10168.

Buzzworm: The Environmental Journal, published bimonthly by Buzzworm, Inc., 2305 Canyon Blvd, Suite 206, Boulder, CO 80302, 800-825-0061.

E Magazine, published monthly by Earth Action Network, Inc., 28 Knight St, Norwalk, CT 06851, 203-854-5559.

Environmental Action, published bimonthly by Environmental Action, Inc., 1525 New Hampshire Ave NW, Washington, DC 20036, 202-745 4870.

Worldwatch, published bimonthly by the Worldwatch Institute, 1776 Massachusetts Ave NW, Washington, DC 20036.

Health

Children's Art Supplies Can be Toxic, by Angela Babin, Perri A. Peltz, and Monona Rossol. This fact sheet is available from Center for Safety in the Arts, 5 Beekman St, New York, NY 10038, 212-227 6220.

Hazardous Substance Fact Sheets, prepared and available from the Right to Know Program, New Jersey Department of Health, CN 368, Trenton, NJ 08625-0368, 609-9842202. They have health and safety information for hundreds of chemicals, many of which are found in consumer products.

Health and Environmental Digest, published monthly by Freshwater Digest, 2500 Shadywood Rd. P.O. Box 90, Navarre, MN 55392-0090.

An Introduction to Toxic Substances, *Glossary of Environmental Health Terms*, *A Guide to Reference Materials on Toxic Substance*, and *Who to Contact for Help and Information About Environmental Health* are booklets available from the New York State Department of Health, Center for Environmental Health, 2 University Place, Albany, NY 12203-3399, 800-458-1158.

Household Hazardous Materials

Cleaning Up Toxics at Home (1990), produced by The Video Project, 5332 College Ave. Suite 101, Oakland, CA 94618, 415-655-9050, for the California League of Women Voters. This is an excellent 25-minute video.

Common Sense Pest Control Quarterly is available from the Bio Integral Resource Center, P.O. Box 7414, Berkeley, CA 94707.

Guide to Hazardous Products Around the Home (1989), by the Household Hazardous Waste Project, 1031 E. Battlefield, Suite 214, Springfield, MO 65807.

Household Hazardous Waste Wheel (1988) and *Home Inventory: Your Guide to Responsible Care of Hazardous Household Products* (1993) are available from Environmental Hazards Management Institute, P.O. Box 283, 137 High Street, Portsmouth, NH 03801, 603-436-3950.

Household Product Disposal Guide (MF-965), K-State Research and Extension, Manhattan, KS 66506, 785-532-5830.

Journal of Pesticide Reform is a quarterly publication of the Northwest Coalition for Alternatives to Pesticides, P.O. Box 1393, Eugene, OR 97440, 503-344-5044. This magazine provides information on pesticide use and abuse.

Pesticides and You is available from the National Coalition Against the Misuse of Pesticides (NCAMP), 530 Seventh Street S.E., Washington, DC 20003, 202-543-5450. The newsletter addresses the use and misuse of pesticides.

Series of brochures available from the Kansas Department of Health and Environment, Office of Health and Environmental Education, Attn: J. Ransom, Landon State Office Building, 900 SW Jackson, Topeka, KS 66612-1290, 785-296-1226:

Automotive Products

Paints and Solvents

Using Household Products Falsely

Using Pesticides Safely

Series of guide sheets available from the Household Hazardous Waste Project, 1031 E. Battlefield, Suite 214, Springfield, MO 65807:

Safe Use, Storage and Disposal of Pesticides (WM6000)

Safe Use, Storage and Disposal of Paint (WM6001)

Selecting Household Safety Equipment (WM6002)

Household Hazardous Products (WM6003)

Material Safety Data Sheets (WM6004)

Store Hazardous Products Safely (WM6005)

Contact HHWP for information on costs and availability.

Safer Products

Clean and Green (1990), by Annie Berthold-Bond, published by Ceres Press, Woodstock, NY.

The Green Consumer (1990), by John Elkington, Julia Hailes, and Joel Makower, published by Penguin Books, New York, NY.

The Green Consumer Letter, (Joel Makower, Editor). A monthly newsletter published by Tilden Press, 1526 Connecticut Ave NW, Washington, DC 20036, 202-332-1700 or 800-955-GREEN.

Guide to Hazardous Products Around the Home (1989), by the Household Hazardous Waste Project, 1031 E. Battlefield, Suite 214, Springfield, MO 65807.

The Healthy Home: An attic-to-basement guide to toxin-free living (1989), by Linda Mason Hunter, published by Rodale Press, Emmaus, PA.

The Nontoxic Home and Office: Protecting Yourself and Your Family from Everyday Toxics and Health Hazards (1992) by Debra Lynn Dadd published by Jeremy P. Tarcher, Inc., Los Angeles, CA.

Nontoxic, Natural, and Earthwise (1990), by Debra Lynn Dadd, published by St. Martin's Press, New York, NY.

Youth Involvement and Protection

A-Way With Waste: A Waste Management Curriculum for Schools, Washington State Department of Ecology, 3190 160 Avenue SE, Bellevue, WA 98008, 206-649-7043.

Environmental Hazards in Your School: A Resource Handbook (1990), publication number 2DT-2001 from the U.S. EPA (TS-799), Washington, DC 20460.

50 Simple Things Kids Can Do to Save the Earth (1990), by the Earthworks Group, published by Andrews and McMeel, Kansas City, MO.

Healthy Homes, Healthy Kids: Protecting Your Children From Everyday Environmental Hazards (1991), by Joyce Schoemaker and Charity Vitale, published by Island Press, Washington, DC.

Pest Control In Schools: Adopting Integrated Pest Management (1992), U.S. EPA Office of Pesticide Programs. Order from the Public Information Center, U.S. EPA, Washington, DC 20460.

School Pesticide Use Reduction (SPUR) Guide: Working Together for Pesticide-Free Schools (1991), by Sharon Taylor and published by the Environmental Health Coalition, 1717 Kettner Blvd, #100, San Diego, CA 92101-2532, 619-235-0281.

Teaching Toxics: Creating Solutions to Household Pollution, Association of Vermont Recyclers, P.O. Box 1244, Montpelier, VT 05601, 802-229-1833.

The No Waste Anthology, California Department of Toxic Substances Control, Education and Information Unit, 400 P Street, Sacramento, CA 95814, 916-322-0476.

Tools for the Environmental Teacher (1991, #WM5003), by the Household Hazardous Waste Project and the California Department of Toxic Substances Control. This is an annotated bibliography of household hazardous waste educational materials and curricula from the United States and Canada for K through 12. Available from HHWP, 1031 E. Battlefield, Suite 214, Springfield, MO 65807.

Toxics in My Home? You Bet!, Golden Empire Health Planning Center. Distributed by Local Government Commission, Inc., 909 12th Street, Suite 205, Sacramento, CA 95814, 916-448-1198.

Sources

Materials adapted with permission from:

A-Way With Waste: A Waste Management Curriculum for Schools, Washington State Department of Ecology, 3190 160 Avenue SE, Bellevue, WA 98008, 206-649-7043.

Home Hazardous Product Survey and What Your Home Haz, Household Hazardous Waste Project, 1031 E. Battlefield, Suite 214, Springfield, MO 65807, 417-889-5000.

SLEUTH: Strategies and Lessons to Eliminate Unused Toxicants. Help!, METRO, Water Resources Section, HHW Project, 103 Nickerson Street, Suite 100, Seattle, WA 98109, 206-689-3050.

Teaching Toxics: Creating Solutions to Household Pollution, Association of Vermont Recyclers, P.O. Box 1244, Montpelier, VT 05601, 802-229-1833.

The No Waste Anthology, California Department of Toxic Substances Control, Education and Information Unit, 400 P Street, Sacramento, CA 95814, 916-322-0476.

Toxics in My Home? You Bet!, Golden Empire Health Planning Center. Distributed by Local Government Commission, Inc., 909 12th Street, Suite 205, Sacramento, CA 95814, 916-448-1198.

Kansas Contacts

Kansas Department of Health and Environment
Bureau of Waste Management
Household Hazardous Waste Program
Building 740 Forbes Field
Topeka, KS 66620
785-296-1600

Kansas Department of Health and Environment
Office of Health and Environmental Education
Landon State Office Building
900 SW Jackson
Topeka, KS 66612-1290
785-296-1226

Kansas State University
Research and Extension
Manhattan, KS 66506-3400
785-532-5820

Kansas Water Office
109 SW 9th St., Suite 300
Topeka, KS 66612-1249
785-296-3185

Mid-America Poison Control Center
University of Kansas Medical Center
3901 Rainbow Blvd., Room B400
Kansas City, KS 66160-7231
800-332-6633

For information on household hazardous waste collections in your area, contact your Kansas Department of Health and Environment.

District Offices:
Northeast District
800 West 24th St.
Lawrence, KS 66046
785-842-4600

North Central District
2501 MarketPlace, Suite D
Salina, KS 67401
785-827-9639

Northwest District
2301 E. 13th St.
Hays, KS 67601-2651
785-625-5663

Southwest District
302 West McArtor
Dodge City, KS 67801-6098
316-225-0596

South Central District
130 South Market
Wichita, KS 67202-3802
316-337-6021

Southeast District
1500 West 7th
Chanute, KS 66720
316-431-2390

Notes:

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